Vol. 16, No. 8 August, 1960

LUBRICATION ENGINEERING

DESIGN RESEARCH APPLICATION EDUCATION MAINTENANCE

See page 354 for Report No. 3 -

THE LUBRICATION ENGINEER IN ACTION

Stuart L. McDoniel at the Sanitary District of Chicago

JOURNAL OF THE AMERICAN SOCIETY OF LUBRICATION ENGINEERS

- it's NEW
- it's SUPERIOR
- it's ACCEPTED

For Severest Roller Bearing Service

The requirement of industrial equipment for greater production creates an ever increasing demand for a superior grease. LEADOLENE 385-M is a new buttery textured grease compounded for work roll and back up roll anti-friction bearings, approach and delivery table bearings and thousands of other applications in industry.

When subjected to the most severe conditions of heavy or shock loads, LEADOLENE 385-M provides the optimum in protection against wear.

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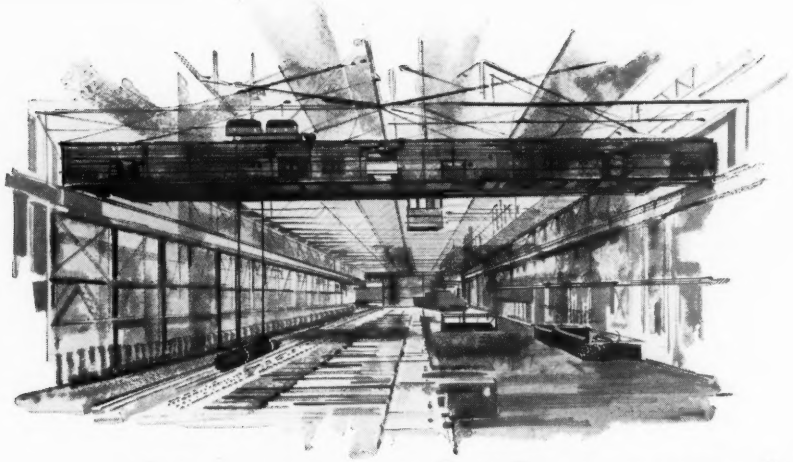

At one of the world's largest integrated steel companies, over 1400 Farval systems unfailingly deliver proper lubrication to each vital bearing on 700 overhead traveling cranes. When equipment is Farvalized . . . maintenance is kept at a minimum.

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Farval-Studies in Centralized Lubrication No. 241

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Better Greases Through BAROID RESEARCH

BARAGEL 24* provides greater stability in greases made from non-petroleum oils

BARAGEL 24, a non-soap grease-gelling agent, gives greater stability to greases made from such non-petroleum oils as polyalkylene glycols, di-2-ethylhexyl sebacate, di-2-ethylhexyl adipate and castor oil. The development of BARAGEL 24 is another result of Baroid Chemicals' research.

Greases compounded with BARAGEL 24 are subjected to the most rigid testing. One of these tests measures grease penetration over the range of unworked to 10,000 strokes. In non-petroleum based oils, BARAGEL 24 produces greases that are exceptionally stable to working in the ASTM grease worker. These greases show minimum breakdown under the most rigorous operating conditions.

BARAGEL 24 is a reaction product of organic ammonium halides and refined sodium montmorillonite. BARAGEL 24 is a member of the BARAGEL-BENTONE* family of products which has been used so successfully in greases, plastics, paints, inks and other fields.

*Trademark of National Lead Company for an organic ammonium montmorillonite

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BAROID

BAROID CHEMICALS, INC.

A SUBSIDIARY OF
NATIONAL LEAD COMPANY

1809 SOUTH COAST BUILDING
HOUSTON 2, TEXAS

Volume 16, No. 8
August, 1960

Lubrication Engineering

DESIGN RESEARCH APPLICATION EDUCATION MAINTENANCE

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LUBRICATION IN THE NEWS

The Society will not be responsible for the accuracy of statements made in this column. Any reference to proprietary products does not imply an endorsement of such products by the Society.

ASTM PUBLISHES MANUAL FOR RATING MOTOR FUELS BY MOTOR AND RESEARCH METHODS

Petroleum technologists now have a research method for determining the knock characteristics of motor fuel above 100 octane. The new tentative method is included in the 1960 edition of the Manual for Rating Motor Fuels by Motor and Research Methods. In addition, the other standards in the volume for rating motor fuels below 100 octane have been revised and brought up to date. Also included are two methods in the addenda. These methods "Proposed Method of Test for Knock Characteristics of Motor Fuels Above 100 by the Motor Method" and "Proposed Method of Test for Motor and Research Octane Number of Small Samples" are included for information only.

The volume contains six appendices which present in a systematic way by word and picture, factual information and data on the operation and maintenance of the knock testing equipment. These appendices discuss apparatus, reference materials, operation, maintenance, installation, building and utility requirements.

Copies of this book may be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa., at $7.50 each. (Source: American Society for Testing Materials)

PACKING SELECTION SIMPLIFIED BY UNUSUAL R/M PACKING CHART

A packing recommendation chart, prepared by the Packing Division, Raybestos-Manhattan, Inc., shows maintenance and engineering personnel the proper packing types to choose for specific applications. This new chart, on stiff paper stock suitable for posting on the wall, suggests seven basic packing types for 95% of all packing needs, including such applications as: pumps and valves, high-temperature valve stem and expansion joints, high-speed rotary air compressors, corrosive and viscous liquids, chemicals, gasket applications, and hydraulic and pneumatic equipment. Direct inquires to: Raybestos-Manhattan, Inc., Packing Division, Passaic, New Jersey. (Source: Raybestos-Manhattan, Inc.)

AEC REPORTS OF CHEMICAL RESEARCH AVAILABLE FROM OTS

Atomic Energy Commission reports of research in chemistry released in May for sale to the public through the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce, Washington 25, D. C., include: GAT-290, *A Study of the Miller's Fluorinated Lubricant: Chlorine Trifluoride Reactions,* Jan. 1960, 23p., 75 cents. ORNL-2811; *Decontamination Testing of Highly Contaminated Protective Coatings,* no date, 26p., 75 cents; and UCRL-9112, *Longitudinal Dispersion in Two-Phase Continous-Flow Operations: Solution and Tables for Cocurrent Flow,* Mar. 1960, 25p., 75 cents.

For further information on these reports, write to Publications and Public Information Division, OTS, Washington 25, D. C. (Source: United State Department of Commerce)

UNION CARBIDE AWARDED AIR FORCE $12 MILLION GRAPHITE DEVELOPMENT CONTRACT

The search for better materials to withstand the terrific heats of space travel has focused on manufactured graphite, a high-temperature material widely used in industry. The U. S. Air Forces Air Research and Development Command through its Wright Air Development Division has awarded a $12 million, three-year research and development contract on graphite for missile and space vehicle components to National Carbon Company, division of Union Carbide Corporation.

Morse G. Dial, chairman of the board and chief executive officer of Union Carbide Corporation, announced the construction of an Advance Material Laboratory at Lawrenceburg, Tenn., where the graphite development work will be carried out. The Laboratory, to be built by Union Carbide and equipped by the Air Force, will consist of a raw materials plant, a pilot processing plant, a completely equipped laboratory, and an office and services building.

The objectives of the research and development program are to explore raw materials and processing techniques that will: (1) significantly reduce the variation in mechanical and physical properties to about one-third (1/3) of the present variation found in the best grades of graphite available today; (2) reduce the total manufacturing time for graphite from many weeks to several days; (3) achieve the foregoing objectives for pieces larger than three feet in diameter by six feet in length; and (4) develop a processing facility to produce such graphites in quantity sufficient for proper evaluation under fullscale conditions.

In tackling the job, National Carbon Company will evaluate the latest concepts of graphite processing, including the preparation of raw materials. Coatings, composites, and laminates will all be thoroughly investigated by trained scientists and engineers. (Source: Union Carbide Corp.)

(Continued on page 380)

INDUSTRY NOTES

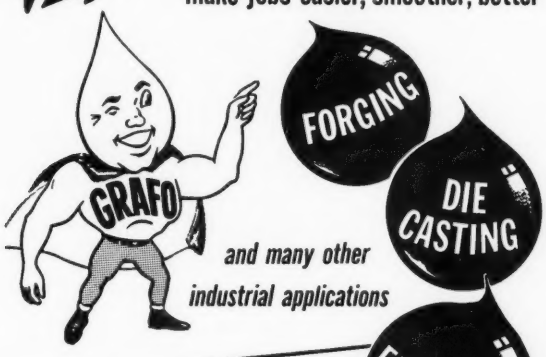
Eaton Manufacturing Company has announced the establishment of a Pacific Coast regional office for the Dynamatic, Cleveland Worm & Gear and Farval Divisions. Ralph E. Bennett has been chosen as regional manager to supervise the sales activities of the three Divisions was announced today by Eaton Manufacturing Company.

Miniature Precision Bearings, Inc., manufacturer of miniature ball bearings, has opened a new sales office in Redwood City, California to provide special assistance to design and application engineers as well as to all others engaged in the selection, purchase, handling and evaluation of precision instrument ball bearings and split-type bearings manufactured by the company's Split Ball Bearing Division.

The Redwood City branch will be supplied with a complete bearing inventory and will be able to provide 24-hour delivery of prototype bearings. It will service accounts in Northern California, Washington, Oregon, Utah, Idaho, Montana, Nevada and Wyoming.

Grafo COLLOIDAL DISPERSIONS

make jobs easier, smoother, better



and many other industrial applications

GRAFO answers the problems of excessive temperatures, pressures or abrasions. Try GRAFO Colloidal Graphite Dispersions in your **forging** operations, or for better metal flow in **extruding** or **die casting.** GRAFO prevents sticking and reduces die wear. There's a GRAFO Water, Oil or Alcohol Dispersion for every industrial need.

Send for booklet "The Biggest Ounce of Protection."

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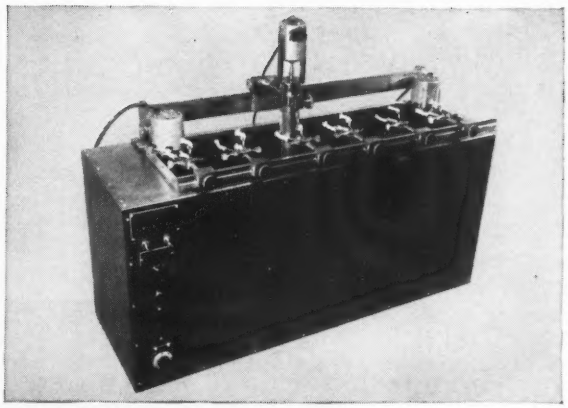


New RAC unit yields demulsibility characteristics of lubricating oils

Utilizing the Wheeling Steel Test Method, this compact new RAC Demulsibility Bath accurately determines the three important factors in establishing lubricating oil characteristics: percentage of water in the oil, total ml. of "free water," and ml. of emulsion separated from the mixture.

The all stainless steel bath is well insulated to prevent heat losses, offers two continuous duty stirrers for even heat distribution and Hevi-duty electrical heaters that provide temperature range from 50° to 250°F. Available in six, four and two-sample units, bath has inside dimensions of 36" X 12" X 18" and is equipped with a variable speed emulsifier with maximum of 8000 RPM. Unit can be easily converted to a regular water bath for other test work. Write for FREE bulletin giving specifications and prices.

RESEARCH APPLIANCE COMPANY

Box 307 • Allison Park, Pa.

ASLE
ASME

7th Annual Joint Lubrication Conference

OCTOBER 17, 18, 19, 1960
IN BOSTON
AT STATLER-HILTON HOTEL

Sponsored by the American Society of Lubrication Engineers and the American Society of Mechanical Engineers, in cooperation with the Boston Section of both Societies.

These subjects and many others will be covered . . .

GAS BEARINGS—Analysis, designs, applications and performance.

UNCONVENTIONAL LUBRICANTS—Dry dusts, liquid metals, corrosive gases, cryogenic fluids.

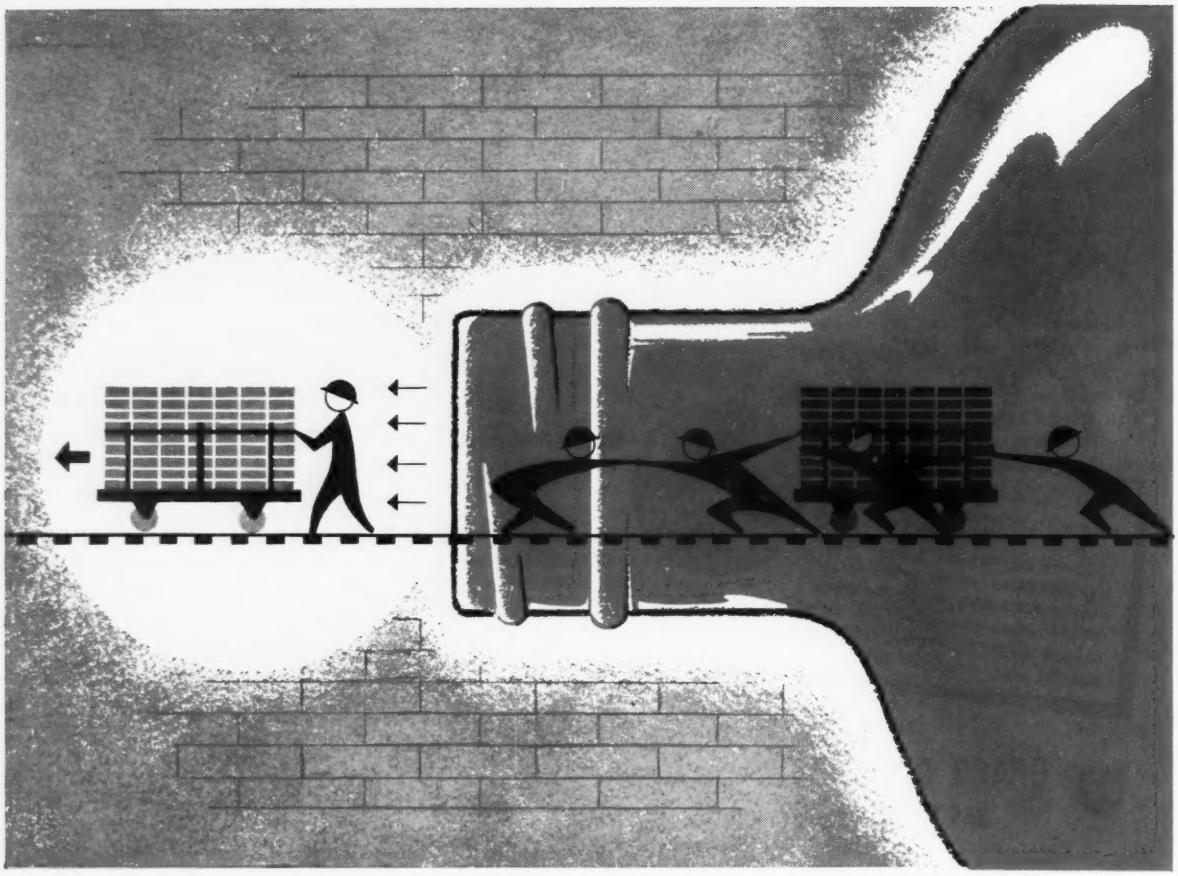
BOUNDARY LUBRICATION PRINCIPLES—Fundamental and applied. Surface chemical effects on metals and lubrication to 1500° F.

HYDRODYNAMIC BEARINGS—New designs, instabilities, effects of various parameters.

LUBRICANTS—Performance in gears and bearings at extreme temperatures and under radiation.

ROLLING CONTACT BEARINGS—Mechanisms of lubrication, friction, stresses, materials.

Plan now to get the benefit of these papers and discussions by men engaged in pushing back the boundaries of the art and the science of bearings and lubrication. See page 347 for a tentative list of papers and titles to be presented by ASLE authors.



New "hot" grease ends brick-oven bottlenecks

. . . and one man outperforms four!

Ceramic Combustion & Engineering Company, consultants for the Davidson Brick Co., Los Angeles, California, ran into production bottlenecks while using ordinary grease in dryer-car bearings. Oven temperatures (350° to 400° F.) cooked the grease solid . . . stalled the cars loaded with bricks in the dryer. Bearings seized so badly that four men were needed to move each carload.

Now—with Shell Darina Grease 2 as the lubricant, Davidson reports: "Bearings roll free, even at 400° F., one man, instead of the four previously required, can *easily* roll a carload of bricks . . . no more bottlenecks caused by frozen bearings."

Darina® Grease 2 is an economical, multi-purpose grease with exceptional stability in high-temperature applications. It offers these outstanding qualities:

HIGH-TEMPERATURE PERFORMANCE. *100° F. better* than conventional multi-purpose greases.

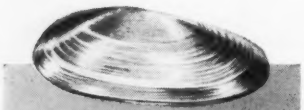
EFFICIENT SEALING. Contains no soap —nothing to melt and run out.

HIGH RESISTANCE TO WATER WASH-OUT. Doesn't dissolve or separate when mixed with water . . . lubricates efficiently under wet conditions.

POSITIVE RUST PROTECTION. Protects bearings even under severe moisture conditions.

ECONOMICAL. Savings up to 35% in grease and labor costs alone are possible because of Darina's superior performance over a wide range of plant operating conditions.

For more information on Darina Grease, write: Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.



An Interesting Fact! Every Shell Branded Industrial Lubricant is named for a sea shell. Shown here: Darina solenoides.

SHELL DARINA GREASE

the multi-purpose, high-temperature grease

SHELL

PERSONALS

The Milwaukee section of ASLE is proud to announce that **Walter A. Alexandroff,** Industrial Sales Manager of The Pate Oil Co., was chosen Lubrication Engineer of the year 1960. This is the first such award to be given by the Milwaukee Section since it was organized in 1945.

Mr. Alexandroff also has been appointed by the ASLE Regional Vice President, Jack Waddell, to be the area representative for the Milwaukee and Chicago Sections.

The Milwaukee Section of ASLE feels that these recognitions have been rightly earned by one of their Section members who has consistantly served the Lubrication Engineers in promoting better standards and service to industry.

WALTER A. ALEXANDROFF

Raymond Cappel has been transferred to the New York Regional Office of Jefferson Chemical Company. Formerly Resident Salesman in Tulsa, Oklahoma, Mr. Cappel will now handle accounts in the Pennsylvania and New Jersey area.

The appointment of A. Henry Schutte as a senior staff member of the chemical engineering section of Arthur D. Little, Inc. has been announced.

Robert E. Wolff has been elected vice president, marketing, of the Van Straaten Chemical Company, Chicago, announces Herbert van Straaten, president. Wolff joined Van Straaten, makers of metal working compounds, last year as general sales manager.

Harold W. LeBoeuf has been named manager of manufacturing of General Electric's Silicone Products Department. He succeeds Dr. James R. Donnalley, who recently assumed the post of general manager of the Company's Insulating Materials Department in Schenectady, New York.

The appointment of Richard C. Erbes as Customer Relations Manager for the Scientific and Process Instruments Division of Beckman Instruments, Inc., has been announced. In his new position, Erbes will direct the Division's Training and Service programs and will coordinate dealer management policy and relations.

Marvin H. Grove has been named Chairman of the Executive Committee, and also appointed to the newly created position of Chief Executive Officer of the Walworth Company, a leading industrial valve and fitting manufacturer. Mr. Grove in also President of Walworth's wholly owned subsidiary, Grove Valve and Regulator Company.

It has been announced that J. Richard Cone has been appointed advertising manager of Lincoln Engineering Company, a division of The McNeil Machine and Engineering Company, manufacturers of ignition system testing and lubricating service and materials dispensing equipment for the automotive field, materials dispensing equipment for the industrial and agricultural applications.

J. F. NICHOLAS

J. RICHARD CONE

James F. Nicholas has been named Chief Engineer to head the new product development program recently announced by the Arguto Oilless Bearing Company, Philadelphia, Penna., manufacturer of a new oil-impregnated plastic alloy bearing material.

from COSMETICS to COMPRESSORS you get top performance with...

UCON
BRAND
FLUIDS AND LUBRICANTS

Whether your product or process calls for a water-soluble cosmetic ingredient or a sulfur-free cylinder lubricant for hydrocarbon gas compressors, UCON fluids and lubricants do the job.

UCON fluids and lubricants also give top performance in many other applications because of these outstanding properties:

- high viscosity indexes
- low pour points
- excellent lubricity
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- sludge and gum resistant
- sulfur-free
- safe to handle

UCON fluids and lubricants are available in both water-soluble and water-insoluble series with wide viscosity ranges.

Find out how these outstanding properties can improve your product or process. Write for F-6500.

Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N.Y.

UCON is a registered trade mark.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

with oil-soluble ALKATERGE®-T

The outstanding performance of Alkaterge-T as an oil-soluble corrosion inhibitor measures up to all expectations.

We ascribe part of this success to its very powerful adhesion to metallic and other hydrophilic surfaces. The force required to break this adhesion has been measured at 10,500 psi – highest of any compound tested! Alkaterge-T is a big molecule and with this adhesion, powerful protection would be expected by most corrosion engineers. But Alkaterge-T has a plus value, too. Mildly alkaline, it will tie up any trace of acidity that may develop, yet it is harmless to brass.

CSC's Alkaterge-T has very good lubricity properties and is a powerful emulsifying agent for water-in-oil emulsions which are unaffected by hard water. As little as 1% will emulsify 80% water into aliphatic hydrocarbons and form a fluid, stable emulsion. In lubricating formulations, Alkaterge-T tends to prevent sludge formation resulting from moisture pickup. It should also be evaluated as a liquefier for water-in-oil sludges.

Can *you* use Alkaterge-T? The mounting evidence suggests you can – especially if you make rust preventive oils, lubricants, cutting oils, extruding oils, transformer oils, corrosion resistant greases, and spinning and throwing oils for the textile industry. *Mail the coupon for data and sample!*

INDUSTRIAL CHEMICALS DEPARTMENT

COMMERCIAL SOLVENTS CORPORATION

260 MADISON AVENUE, NEW YORK 16, N. Y.

Please send me: ☐ *Technical Data Sheet No. 3A* ☐ *Sample of Alkaterge-T*

Name_____ Title_____

Company_____ Street_____

City_____ Zone_____ State_____

NEW PRODUCTS

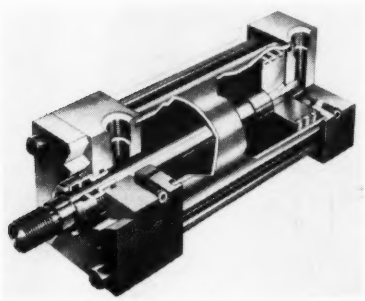
SOLID FILM LUBRICANTS UNAFFECTED BY EXPOSURE TO NUCLEAR IRRADIATION ANNOUNCED

Electrofilm, Inc. has developed specific solid film lubricants which are claimed to operate without deterioration when exposed to nuclear irradiation of the order of 1 x 10^7 Roentgens up to 1 x 10^9 Roentgens at temperatures up to 550°F. Electrofim dry film lubricants are also corrosion resistant, and lubricate in temperatures from —65°F to 1800°F. It is claimed that their friction and wear life properties are such that they can meet Mil Spec 25504.

For complete technical data on this complete line of solid film lubricants write Electrofilm, Inc., 7116 Laurel Canyon Blvd., North Hollywood, California, for Solid Film Lubricant Catalog, LB-6.

NEW HYDRAULIC CYLINDER LINE INTRODUCED

A new line of power cylinders for use in medium-high pressure hydraulic service has been announced by the Power Cylinder Division of Hannifin Company, a division of Parker-Hannifin Corporation.



Designed for use with 1000 p.s.i. pumps, the new Series "L" Cylinders have been termed "The Thousand Pound Line" by the manufacturer and are available in bore sizes from 1-inch through 8-inches, all designed to operate at full 1000 p.s.i. hydraulic pressure. They are of square head and tie rod design, and provide case hardened and hard chromium plated piston rods as standard. Drip-free rods and leak-proof ports are also featured, and fourteen different mountings are available from which to choose.

Additional information on "The Thousand Pound Line" is available from Hannifin Company Power Cylinder Division, Dept. 312, Des Plaines, Illinois.

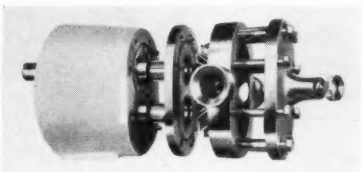
COMPLETE LINE OF HYDRAULIC PISTON ACCUMULATORS INTRODUCED

Hydrodyne Industries, Inc., a new company, announces the introduction of a complete line of hydraulic piston accumulators for use wherever fluid power is used. The three "O" ring piston accumulator cover a range of 10 cu. in. to 23 gallons; pressures up to 10,000 psi; temperatures up to 400°F.

For further information write: Hydrodyne Industries, Inc., 500 Shames Drive, Westbury, L. I., New York.

STAINLESS STEEL HIGH PRESSURE PUMP NOW AVAILABLE

A new stainless steel, high pressure pump incorporating stainless steel is now available from Sonic Engineering Corporation of Stamford, Conn. Two sizes cover a capacity range from 1 to 30 gpm —pressures to 400 psi—temperatures to 180°F or higher with special seal materials. The pump may be quickly disassembled for cleaning.



For more information write to: Sonic Engineering Corporation, 146 Selleck St., Stamford, Conn.

NEW DRUM HEATER ANNOUNCED

A new model complete drum heater which permits lifting or lowering by pulleys and counter-balancing weight has been announced by Glas-Col Apparatus Company. The unit is designed for controlled heating of tars, asphalts, heavy oils, greases, paints, varnishes, pitches, resins, plastics, shortening, and gelatinous materials. The cover, cylindrical section and portable base are constructed of aluminum. Heavy casters on the base unit make it easy to move with or without a load. Descriptive literature is available on request from Glas-Col Apparatus Co., 711 Hulman St., Terre Haute, Indiana.

NEW NON-TOXIC COOLING WATER TREATMENT ANNOUNCED

Dearborn 860, a non-toxic corrosion inhibitor for use in both open recirculating and once-through cooling systems where toxic contaminants are not permitted by state and local regulations, has been announced by Dearborn Chemical Company, Chicago, Ill.

It is claimed that Dearborn 860 quickly forms a protective film, thus providing rapid control of localized pitting as well as general corrosion. In open recirculating systems, the organic constituent of Dearborn 860 provides insurance against carbonate and phosphate deposits, and interfers with crystal growth, even under severe scaling tendencies of water.

For additional information on Dearborn 860, write Dearborn Chemical Company, Merchandise Mart, Chicago 54, Illinois.

COMPACT FILTER ANNOUNCED

An easily installed, compact filter for oil, coolant and hydraulic lines announced by Wire Cloth Products, Inc., is said to filter up to 300 gallons of fluid per hour. The new unit is the Model C-4510 Bell Filter, 12" in overall height, 9" in diameter and weighing less than 10 pounds.

Fluids passing through the filter are forced through multiple layers of Diatomaceous Earth Powder and fine mesh monel screen. The combination of natural and mechanical filtering elements traps suspended solids and foreign particles down to the size of one micron.

The manufacturer designed the Bell C-4510 in a compact size and light weight for easy installation in small space between the pump and coolant outlet, or in any oil or hydraulic line.

Full details and a descriptive bulletin are avaiable on requests addressed to Wire Cloth Products, Inc., 2801 Congress Street Expressway, Bellwood, Illinois.

(Continued on page 342)

NEW PRODUCTS

(*Continued from page 341*)

NEW SOLENOID-OPERATED VALVE ANNOUNCED

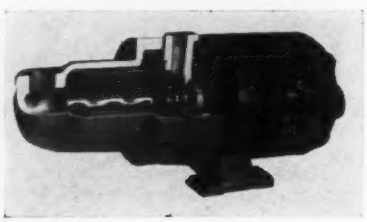
A new solenoid-operated pinch-type valve that can be used for metering, sampling, or "on-off" control in applications involving corrosive fluids, slurries, dry powder, or sanitary products has been announced by RKL Controls, Inc. of Hainesport, N. J.

Catalogued as the Series Rs, the new valve is claimed to consist of a rubber body that is pinched closed by the spring-loaded solenoid mechanism with no moving parts in the fluid stream, and no seats, discs, or packing glands to leak. The simple design principle is completely free of any cavities, and permits straight-through flow in either direction. It weighs 4.5 pounds, measures 2½" x 7¼" x 3¼", and is furnished in body sizes from 1/16" up to 1".

For additional information, write RKL Controls, Inc., Hainesport Industrial Park, Hainesport, New Jersey.

PRESSURE KOOL PUMPS

A displacement coolant pump for coolant delivery systems has been developed for the machine tool industry. The PresSure Kool pump reportedly utilizes the Moyno principle in the form of a helical screw rotor turning in a stator to insure positive delivery of coolants or cutting oils at any one or more constant pressures.

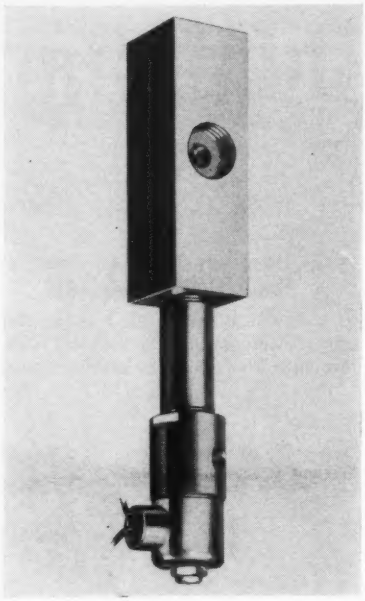


PresSure Kool's vibration-free positive displacement pump is designed to deliver clear, non-foaming coolant without constant manual control of coolant flow. PresSure Kool's outlet design makes it possible to operate several delivery lines simultaneously under differing, but constant pressures.

For literature and performance data, write to Products Division, Associated Engineers, Inc., P. O. Box 1628, Springfield, Massachusetts.

NEW METERING PUMP ANNOUNCED

Airmatic Valve, Inc. announces a metering pump that has an adjustable capacity from 0 to 6.44 cc. The unit consists of a solenoid-actuated pneumatic cylinder and a pumping head. The pumping contains inlet and outlet ports and provision for limitation of the length of



the stroke of the air cylinder piston. Air ports are ¼", cylinder stroke is 0 to 2", fluid line connections are ¼": Solenoids are available for most AC or DC voltages. Materials employed in pumping head and piston can be varied to suit requirements of material being pumped. Check valves are not integral and may be placed in the inlet and outlet lines if necessary.

The manufacturer claims that the pump provides precision metering of even the most heavy-bodied liquids since pumping pressure can be as much as 354 psi. Pumping pressure is determined by air pressure (up to 200 psi) and air cylinder bore (1, 1-⅛ and 1-½").

For additional information write Airmatic Valve, Inc., 7313 Associate Ave., Cleveland 9, Ohio.

JOINT AND SEALING COMPOUND NOW PACKAGED IN NEW BRUSH-TOP CANS

Now available in a new brush-top pint size can is Gasoila, a pipe joint and sealing compound. The new pint can is convenient to handle and the brush is permanently fastened to the lid, ready for instant use and easy application.

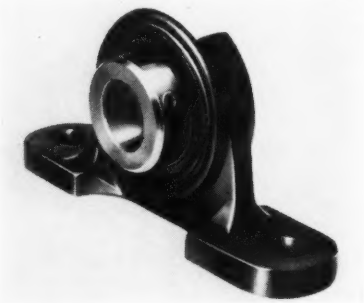
Insoluble in pertoleum products, refrigerants, propane, butane and most other commercial solvent, Gasoila is claimed to contain no grit, remains elastic and flexible, insuring a positive joint but is easy to take apart and withstands severe vibration and temperature changes. As a sealer, Gasoila works equally well on threaded or flanged joints and on all connections, with or without cork, fiber or metal gaskets.

For full information, bulletins and price list write to Federal Process Company, 1120-P Citizens Building, Cleveland 14, Ohio.

CONTACT SEALS AVAILABLE WITH LOW-COST "L" SERIES BEARING UNITS

The SEALMASTER Bearing Division of the Stephens-Adamson Mfg. Co., announces the availability of contact seals with the popular, low-cost "L" Series Bearing Units.

The "L" Series line of bearing units feature precision, one-piece malleable iron housings for greater strength and light weight. The units are ready for easy assembly on the shaft-eliminating loose pieces that require high-cost additional assembly on the job.

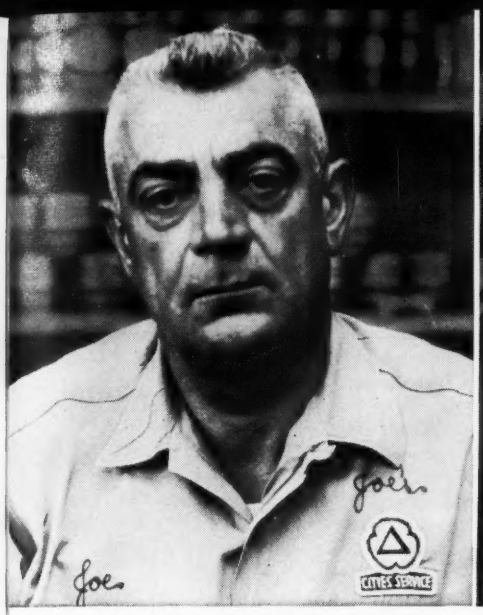


The "L" Series Bearing Units are available in pillow blocks and two or three bolt flange models for flush or recessed mountings. Housings also provide full housing contact under bearing ball path.

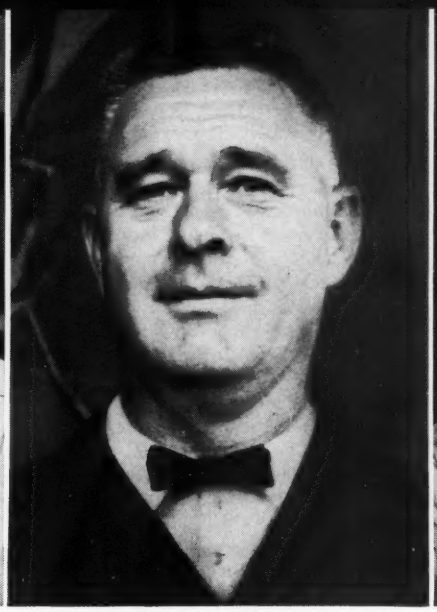
In all "L" units (LP, LF, LFT), unrestricted self-alignment, even after mounting, reportedly takes place automatically between the spherical O.D. of the bearing and the spherical I.D. of the housing.

For further information on the "L" Series Line of low-cost bearing units, write for Bulletin 359, SEALMASTER Bearing Division, Stephens-Adamson Mfg. Co., Ridgeway Avenue, Aurora, Illinois.

(*Continued on page 344*)



"Since standardizing on Trojan HM 'Moly' Grease, my gasoline sales *alone* have gone up 35%. TBA and oil sales are up and I've gotten new customers from way out of town." Joe Scillieri, JOE'S CITIES SERVICE STATION, Hackensack, N.J.



"Once a customer tries Esso MP Grease ('Moly') he can feel the difference immediately. And each time he comes back, we get a chance to sell more gas, oil and TBA than we ever did before." Jim Elborn, ELBORN'S IMPERIAL ESSO SERVICE STATION, Don Mills, Ontario.

"Word about my Mobilgrease Special (with 'Moly') lube jobs spread fast. I began to pick up a lot of new local business, repeat business. Sold a lot more gasoline, oil and TBA." Richie Christenson, KEN WEST MOBIL SERVICE STATION, White Plains, N.Y.

How "MOLY" multi-purpose greases boost service station traffic

A good, profitable service station business is built on confidence in the operator. And, nothing builds confidence as fast as benefits customers can notice right away.

Easier steering, no squeaks, quieter riding — customers can feel these benefits within a few blocks when they get a "Moly" multi-purpose grease job for ball joints, wheel bearings and other grease lubricated parts.

The reason: "Moly" Greases contain Molysulfide®, an additive that puts extra lubricity into a grease, gets in between rubbing metal surfaces fast . . . and stays there! Won't squeeze out or wash out.

Result: Customers not only come back for repeat jobs, they become service stations' best salesmen. New customers come in. From then on, it's up to each dealer to take advantage of the increased traffic.

Get the facts on what "Moly" Greases can do for service station sales. For details, write Climax Molybdenum Co., Div. of American Metal Climax, Inc., 1270 Avenue of the Americas, New York 20, N. Y.

"MOLY" GREASE SUPPLIERS:

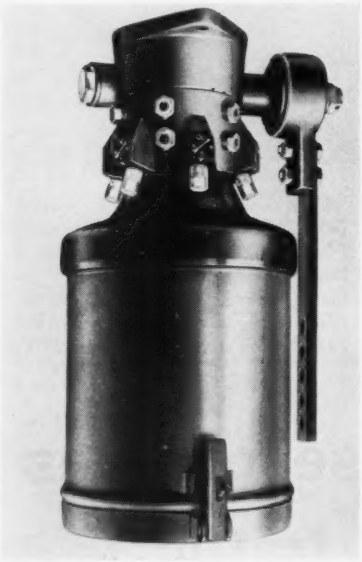
Amoco • Cities Service • Conoco • Crown • Frontier • Gulf • Jenney • Mobil • Pennzoil • Phillips • Sinclair • Skelly • Std. of Ind. • Std. of Ky • Sunoco • Texaco CANADA: B-A • Canadian Oil Cos. • Cities Service • Esso Imperial • Sunoco • Texaco

NEW PRODUCTS

(Continued from page 342)

NEW CENTRALIZED LUBE PUMP INTRODUCED

A new positive-pressure centralized lubrication pump designed to deliver exact amounts of grease or oil instantaneously to all bearing points through individual lines has been introduced by Research Appliance Company, Pittsburgh.



The new valveless De Limon Model FZ pump is designed primarily for machinery requiring comparatively small amounts of grease to be applied constantly in many areas.

Further information may be obtained by writing Research Appliance Company, P. O. Box 307, Allison Park, Pa.

IMPROVED NEEDLE THRUST BEARINGS DEVELOPED

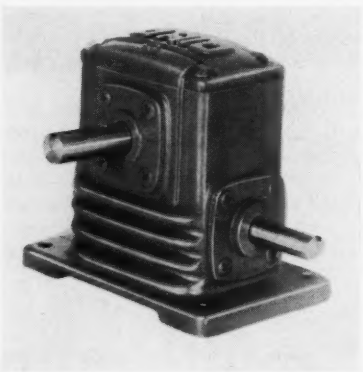
An improved type of needle thrust bearing using a glass fiber filled nylon retainer has been introduced by The Kaydon Engineering Corp., Muskegon, Michigan.

The new bearing, Type "NJ", employs a nylon retainer that reduces undesirable sliding friction inherent in the all-steel type of needle thrust bearings. The use of nylon reportedly provides greater life with negligible retainer wear. Thrust capacity of the new bearing is said to be equal to or greater than the capacity of all-steel bearings, and the permissible operating speeds are greater.

For more information, write Kaydon Engineering Corp., McCracken Street, Muskegon, Michigan.

NEW WORM AND GEAR REDUCER OFFERED

The Ohio Gear Company, Cleveland, Ohio, has announced a new model fin and fan cooled worm and gear speed reducer designated the Series S-13, featuring heavy bearing capacity, shorter center distance between worm and gear and improved heat dissipation characteristics. The unit is designed for horizontal right angle drive with the worm below and is said to be capable of delivering up to 80% more capacity than comparable non-ventilated models of equal size. The increased capacity is reflected in far smaller space requirements for the new reducers. It empoys a worm and gear



reduction and features heavy duty ball bearings in all shafts. The reducer is available in a complete range of sizes from 1.33" to 5.25" center distance. Horsepower ratings range from 1/16 to 18 h.p.

For complete informtion write The Ohio Gear Company, 1400 East 179th Street, Cleveland 10, Ohio.

CONVENIENT MoS_2 DRY LUBRICANT STICK AVAILABLE

Extreme-pressure molybdenum disulfide dry lubricant is now available from The Alpha-Molykote Corp. Resin bonded for greater strength, the Molykote Lubricating Stick was developed to permit easy application of a lubricating film to cutting and shaping tools, sliding areas of small and medium size machine parts, or wherever metallic dry friction occurs on sliding surfaces.

The manufacturer states that the Molykote Lubricating Sticks also have proved to be useful on small surfaces where oil cannot be used because of contamination, temperature restrictions, etc. It is reported that the stick can be formed in any desired size for use as an element in the bearings of small machines, ways and light equipment undergoing oscillating movements.

Additional information may be obtained by writing to The Alpha-Molykote Corp., 65 Harvard Avenue, Stamford, Connecticut.

LOW-PRESSURE CARTRIDGE RELIEF VALVE ANNOUNCED

A new low-pressure cartridge relief valve used for control of pressurized fluids has been announced by Fluid Regulators Corporation. When installed in a single body or a multi-valve manifold, the cartridge simplifies circuitry and it can be removed for servicing without disconnecting lines.

Specific operating pressures are covered by three pressure ranges. Final adjustment for actual operating pressure requirements within a particular range is made by an external pressure adjusting screw. Also, the valve design permits field pressure adjustment to meet particular operating conditions.

Additional information may be obtained from Fluid Regulators Corporation, 313 Gillete Street, Painesville, Ohio.

"DRY" GRAPHITE LUBRICANT AVAILABLE IN AEROSOL PACKAGE

Sprayon No. 204 Dry Graphite Lubricant, manufactured by Industrial Supply Division, Sprayon Product, Inc., provides even dispersion through aerosol application. Packed in a 12-oz. self-spraying can, the graphite is part of Sprayon's line of 47 maintenance and production aids in aerosol containers.

Made of a synthetic graphite and specially formulated for aerosol use, Sprayon No. 204 Spray is recommended wherever a "dry" lubricant is indicated, where petroleum products must be avoided, where temperatures are extreme.

A free handbook of Sprayon "Aerosols for Industry" is available from Industrial Supply Division, Sprayon Products, Inc., 2075 East 65th St., Cleveland 3, Ohio.

Gears, roll necks and bearings "shielded" by Ironsides tailored-to-the-mill lubricants are successfully carrying the loads of higher speed production.

Ironsides

SHIELD PRODUCTS

The Ironsides Company, Columbus 16, Ohio—Compounders of Palmoshield and other Shield lubricants

In a delivery to the U.S. Steel Gary works, the temperature of the grease was 25°F. Still, 22,860 lbs. of grease were pumped to the storage tanks in 65 minutes, with a pressure of 100 psi.

Cities Service Announces

REVOLUTIONARY CONCEPT IN BULK GREASE HANDLING

Until now the standard container for shipping and handling industrial greases has been the 400 lb. drum. For companies using large quantities of grease, these drums present such problems as: cost of storage and multiple handling—full and empty; up to 10% residuary waste; and the necessary cost of the drums themselves.

Cities Service, in cooperation with DuBois Engineering and Manufacturing Corp., recently embarked upon a program to develop a system for delivering grease in bulk from "the grease kettle to the bearing." The result is a tractor-trailer unit with two 12,000 lb. capacity containers. A gear-type pump on the truck transfers the entire load to the customer's stationary central storage containers in less than an hour. This system revolutionizes the concept of grease handling for companies using centralized systems.

The new Cities Service bulk-delivery truck is presently operating in the mid-west states with plans for expanding this service to other areas.

If you are a bulk grease user, the time and money this system can save you are well worth looking into. For the full story, call your local Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Ill.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Seventeen ASLE Papers to be presented at Joint Lubrication Conference

Seventeen important papers are scheduled to be presented by ASLE authors at the 1960 ASLE-ASME Joint Lubrication Conference. This conference will be held at the Statler-Hilton Hotel in Boston, October 17, 18, 19, 1960. Sponsored jointly by the American Society of Lubrication Engineers and the Lubrication Division of the American Society of Mechanical Engineers, this year's meeting is expected to be very well attended by members of both societies. Listed below are tentative papers and titles to be presented by ASLE authors.

"Inhibiting Corrosive Wear in Lubrication with Halogenated Gases at 1500°F by Use of Competitive Reactions and Other Methods"
by D. H. Buckley and R. L. Johnson, NASA, Lewis Research Center, Cleveland, Ohio, (Paper No. 60LC-1)

"The Instantaneous Coefficients of Gear Tooth Friction"
by G. H. Benedict and B. W. Kelley, Caterpillar Tractor Co., Peoria, Ill., (Paper No. 60LC-2)

"Experiences with Scuffing-Tests on Gear Oils in Back to Back Rigs"
by G. Niemann, H. Rittig and G. Lechner, Technische Hochschule Munchen, Germany, (Paper No. 60LC-3)

"Evaluation of Ball Bearing Separator Materials Operating Submerged in Cryogenic Liquids"
by W. A. Wilson, K. B. Martin, and J. A. Brennan, National Bureau of Standards, Cryogenic Engineering Laboratory, Boulder, Colo., (Paper No. 60LC-4)

"The Performance of Ball Bearings in Nitrogen and Carbon Dioxide at Elevated Temperatures"
by K. G. Eickhoff and A. White, United Kingdom Atomic Energy Authority, Chester, England, (Paper No. 60LC-5)

"The Behavior of Lubricating Oils in Inert Gas Atmospheres'
by A. Beerbower and D. F. Green, Esso Research and Engineering Co., Linden, N. J., (Paper No. 60LC-6)

"Orthogonally Displaced Bearings, I"
by D. F. Wilcock, General Electric Company, Pittsfield, Mass., (Paper No. 60LC-7)

"The Effect of Lubricant Viscosity and Composition on Engine Friction and Bearing Wear"
by E. H. Okrent, Esso Research and Engineering Co., Linden, N. J., (Paper No. 60LC-8)

"Friction and Wear of Metals in Gases up to 600°C"
by D. F. Cornelius and W. H. Roberts, United Kingdom Atomic Energy Authority, Chester, England, (Paper No. 60LC-9)

"Metallic Contact and Friction Between Sliding Surfaces"
by M. J. Furey, Esso Research and Engineering Co., Linden, N. J., (Paper No. 60LC-10)

"Development of a High Temperature Seal Material"
by R. J. MacDonald, Clevite Research Center, Cleveland, Ohio, (Paper No. 60LC-11)

"Transient Lubrication of an Accelerated Slider Bearing"
by F. A. Lyman and E. A. Saibel, Renesselaer Polytechnic Institute, Troy, N. Y., (Paper No. 60LC-12)

"A Novel Form of Self-Acting Gas Lubricated Thrust Bearing"
by A. Nahavandi and F. Osterle, Carnegie Institute of Technology, Pittsburgh, Pa., (Paper No. 60LC-13)

"A Numerical Solution for the Finite Gas Lubricated Full Journal Bearing"
by A. A. Raimondi, Westinghouse Research Laboratory, Pittsburgh, Pa., (Paper No. 60LC-14)

"Pressurized Journal Gas Bearings"
by J. H. Laub, Jet Propulsion Laboratory, Pasadena, Calif., (Paper No. 60LC-15)

"Externally Pressurized Spherical Gas Bearings"
by J. H. Laub and R. H. Norton, Jet Propulsion Laboratory, Pasadena, Calif., (Paper No. 60LC-16)

"The Performance of Externally Pressurized Bearings Using Simple Orifice Restrictions"
by D. S. Allen, P. J. Stokes, and S. Whitley, United Kingdom Atomic Energy Authority, Chester, England, (Paper No. 60LC-17)

Preprints of the above papers will be available at the Conference for those attending. They will also be available at the ASLE National Office for mail-orders after October 15, 1960. Abstracts of these papers will appear in next month's issue of Lubrication Engineering.

ASLE **ASME**

7th ANNUAL JOINT LUBRICATION CONFERENCE
October 17, 18, 19, 1960
In Boston
at Statler-Hilton Hotel

Plan to attend this important conference. The registration fee is $5.00 for members and $7.00 for non-members.

PRODUCT LITERATURE

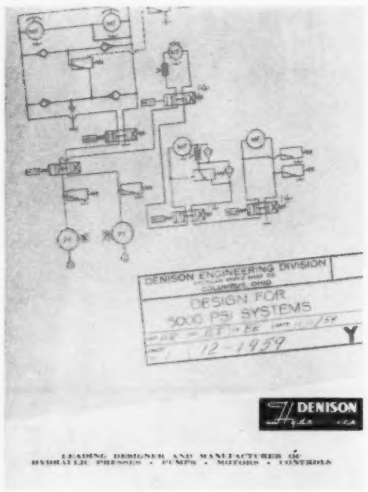
CATALOG DESCRIBES LUBRICATING EQUIPMENT

Condensed catalog X-135 list a variety of the most widely used lubricating equipment for handling a multitude of oiling jobs. Drawings, specification tables and descriptive paragraphs round out the data on a complete line of oil cups, oiling systems, dispensers, valves and flow indicators, oil gages and chain oilers as well as several new oil-Rite developments.

A copy of Catalog X-135 may be obtained by writing Oil-Rite Corp., 2328 Waldo Blvd., Manitowoc, Wisc.

HYDRAULIC COMPONENTS BULLETIN PUBLISHED

A new six page bulletin describing Denison Engineering components designed for hydraulic systems up to 5000 psi has just been published by Denison Engineering Division, American Brake Shoe Co., Columbus, Ohio.



A wide range of pumping units, vane and axial piston fluid motors, flow control valves, check valves, pilot operated pressure control valves, directional control valves, remote control valves and electro-hydraulic pressure control valves are reviewed. General specifications as well as photographs of typical models are included. Reference numbers to bulletins giving more detail on individual models are included with each discussion.

Bulletin 146-F may be obtained from Denison Engineering Division, American Brake Shoe Co., 1160 Dublin Road, Columbus, Ohio.

LOW-PRESSURE HYDRAULIC RELIEF VALVE DATA SHEETS AVAILABLE

A series of new data sheets detailing a low-pressure hydraulic cartridge relief valve and its applications has been announced by Fluid Regulators Corporation. The free literature illustrates how the externally adjustable cartridge can be used in a body to provide different valve porting combinations. The data sheets feature pressure curves, dimensions and complete specifications for this direct acting relief valve.

Data sheets on this valve are available from Fluid Regulators Corporation, 313 Gillette Street, Painesville, Ohio.

W/O EMULSION HYDRAULIC FLUIDS AND OIL-SOLUBLE CORROSION INHIBITORS BULLETINS PUBLISHED

Technical bulletins on Atpet 200, an oil-soluble corrosion inhibitor for ferrous surfaces, and Atpet 80, an oil-soluble, non-metallic corrosion inhibitor, are available from Atlas Powder Company. These bulletins give general characteristics, applications, and specifications of the products.

The Atlas Powder Co. also offers a technical bulletin on water-in-oil hydraulic fluids. This bulletin contains typical emulsion formulations as well as a composition for low viscosity emulsion fluids and a formula for an emulsion to be used in high temperature operations.

The Atlas Technical Bulletins are available from the manufacturer, Atlas Powder Co., Wilmington 99, Delaware.

BROCHURE EXPLAINS USE OF MICRO-CAM VALVE FOR OIL FLOW CONTROL

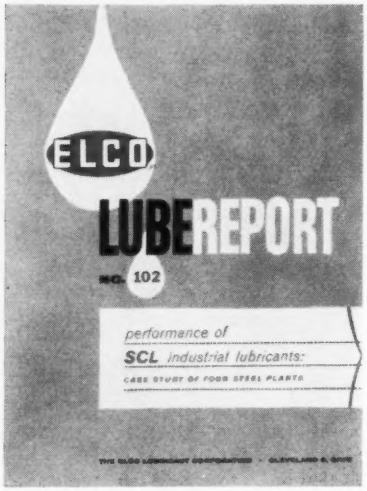
An illustrated brochure, describing features of a Micro-Cam oil valve designed for precision control of oil flow to any type burner, has been published by Hauck Manufacturing Company, Brooklyn, N. Y.

The brochure provides information on how the Micro-Cam valve can be used to improve operation of oil-fired heat processing equipment. Copies may be obtained from Hauck Manufacturing Company, 124-136 Tenth St., Brooklyn 15, by specifying Data Sheet No. GA704FC.

NEW BULLETIN DISCUSSES INDUSTRIAL LUBRICANTS

Lube/Report No. 102, "Performance of SCL Industrial Lubricants," is the title of a new bulletin published by The Elco Lubricant Corporation. This 12-page report presents detailed information on the factors involved in the selection and use of lubricants for industrial plant machinery.

Featured is a comprehensive case study of the use of SCL-type lubricants in four steel plants. After 22 years, the lubricant performance record is reported as perfect—not a single gear failure due to breakdown of the lubricant. The lubrication practices and properties of SCL lubricants which produced this record are described.



This bulletin will be valuable to all industrial plant personnel responsible for the selection of lubricants or the maintenance of machinery.

Copies of Lube/Report No. 102 may be obtained from The Elco Lubricant Corporation, Jennings Road & Denison Avenue, Cleveland 9, Ohio.

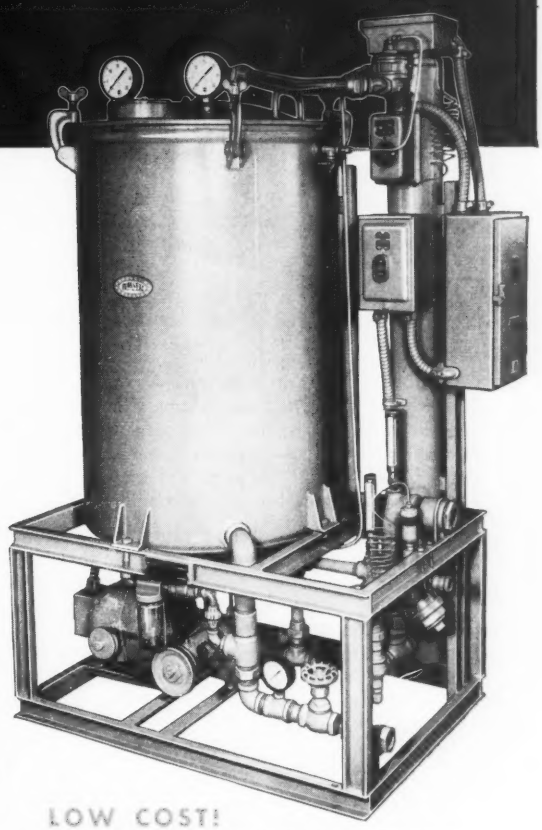
CIRCULAR ON BRONZE GATE VALVE PUBLISHED

A four-page, two-color circular describing the new Union Bonnet Bronze Gate Valve, Fig. 3125, has been published by the Lunkenheimer Co. of Cincinnati, Ohio. Sectional views detail the features of a new bronze gate valve. Also included is a table of dimensions. Available in sizes ¼- to 2-inch, Fig. 3125 has a double wedge disc and rising stem and is rated 125 lb. S.P.—200 lb. W.O.G. For copies of the new circular on Fig. 3125 Union Bonnet Bronze Gate Valve, write to The Lunkenheimer Company, Cincinnati 14, Ohio.

DRY-CLEAN YOUR OIL AT LESS COST WITH

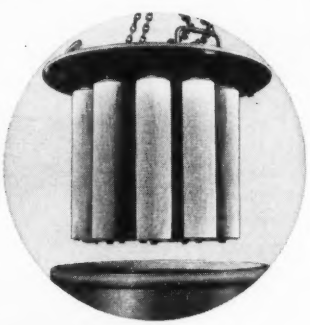
FIL-THERMO-VAC

OFFERS . . . a low cost, highly efficient method of removing WATER and DIRT from lube oils.



FIL-THERMO-VAC ADVANTAGES

- **Proved more effective . . . and costs less than centrifuging.**
- **Results in a drier oil. Equally effective with petroleums or synthetics.**
- **Requires only part-time operator . . . saves man hours.**
- **Serves as an excellent emulsion breaker . . . eliminates need for extra equipment.**
- **Does not remove additives or inhibitors from oil.**



Oil disperses through fiberglas micro-filters into vacuum chamber where water and other volatiles are drawn off . . . condensed and ejected.

LOW COST!

Automatic self-policing "package system" costs less, does better job than any other method. It will pay to get the facts!

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BOWSER, INC.
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Date_____

Gentlemen: Please send 12-page Fil-Thermo-Vac folder to:

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CITY_____ STATE_____

GREATER RUN-IN PROTECTION EXTENDS PISTON LIFE OF CURTISS-WRIGHT ENGINES

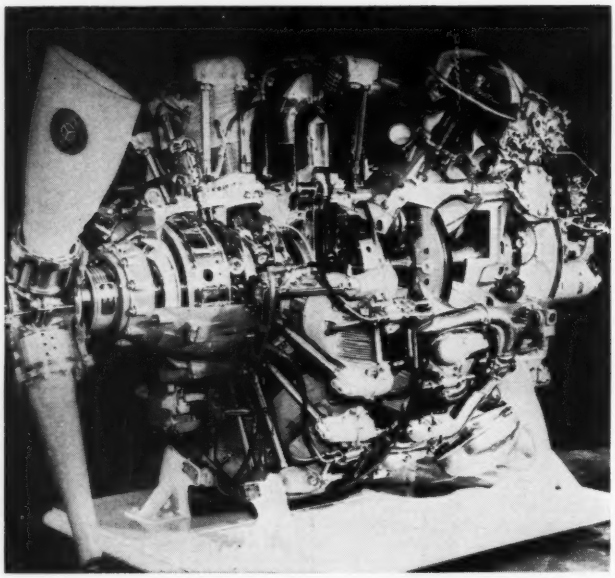

Photo courtesy of Curtiss-Wright Corp.

Curtiss-Wright Corporation's Wright Aeronautical Division, located at Wood-Ridge, N.J., has extended the "life span" of pistons used in their radial reciprocating airplane engines. By coating piston skirts with 'dag' 213 — a dispersion of graphite in an epoxy-resin binder — they are protected against scuffing, scoring, galling, and seizing during the critical running-in period.

Where previously Curtiss-Wright engineers had used finely powdered graphite and phenolic resin, they found that 'dag' 213 was more uniform in consistency and had better adhesion . . . was actually adsorbed by the surface to form a more durable, corrosion-resistant film that became virtually integral with the metal. Due to the heat-transmission properties of 'dag' 213, the coefficient of friction is kept at a uniform minimum to assure free action and proper wear-in characteristics. The exacting clearances in reciprocating engine design make the run-in process so critical that perfect friction and heat control must be maintained under the speeds and loads required. In addition, the graphoid surface takes over the job of supporting the load if the liquid lubricant ruptures momentarily during run-in, thereby preventing metal-to-metal contact until the oil film re-establishes itself.

'dag' 213 is spray-applied at Curtiss-Wright with conventional spray equipment. After the piston skirts are coated, the preassembled pistons are oven-heated at 350°F for 2½ to 3 hours. Fabrication and treatment techniques used at Curtiss-Wright permit a high degree of accuracy in maintaining piston and cylinder wall tolerances. Only forged aluminum alloys are used for these pistons which operate within nitrided steel cylinder walls. The application of Acheson's 'dag' 213 has been extended to all models of Curtiss-Wright engines in both their 18 and 9-cylinder categories. Investigate the use of an Acheson Dispersion in your own assembly or run-in application. Write Dept. LE-80.

New Literature Describes Assembly and Run-in Uses

The value of Acheson Dispersions as additives in assembly and run-in lubricants is described in easy-to-read form in a recently printed brochure, Bulletin 421. A copy for your personal file is available immediately upon request.

It covers the many advantages Acheson customers are gaining in these critical applications by using colloidal dispersions which:

1. Provide smoother bearing surfaces through control of the wear rate.
2. Permit closer tolerances due to their microscopic, flat particle size.
3. Allow increased power because of reduced friction.
4. Lower bearing temperatures.
5. Increase the affinity of mating metal surfaces for oil.
6. Lessen oil consumption.
7. Shorten the period necessary for run-in.
8. Protect against momentary oil failure.
9. Lower maintenance and replacement costs.
10. Insure a longer, more trouble-free equipment operating life.

If you are concerned with the design or manufacture of engines, motors, bearing assembly, or machinery, Bulletin 421 should prove of interest to you. The vital contribution which Acheson Dispersions of colloidal graphite or molybdenum disulfide make in safeguarding against excessive wear during running-in, is a matter of record. Also, Acheson dry film lubricants, used in assembly press fit applications, are providing effective lubrication without sacrificing the tolerances involved. Send for your copy of Bulletin 421, "For Assembly and Run-in Lubrication".

'dag' is a trademark registered in the U.S. Patent Office by Acheson Industries, Inc.

ACHESON

dispersions digest reporting uses for

dag® BRAND DISPERSIONS

ACHESON **Colloids Company** PORT HURON, MICHIGAN

A division of Acheson Industries, Inc. Also Acheson Industries (Europe) Ltd. and affiliates, London, England

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New ASLE Members—June, 1960

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NELS G. JOHNSON (R)*
Ritter Engineering
Chicago, Illinois

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PITTSBURGH

WILLIAM C. CARR
The Brooks Oil Company
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JOHN H. HERSHISER
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Johnstown, Pennsylvania

NEW YORK

H. E. ACHILLES
Tidewater Oil Company
New York, New York

PHILADELPHIA

SAMUEL E. CHARLTON
Esso Standard Div. of
Humble Oil & Refining Company
Bala-Cynwyd, Pennsylvania

BALTIMORE

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Bethlehem Steel Company
Sparrows Point, Maryland

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Vol. 16, No. 8

Lubrication Engineering

industry's working partner

. . . . . this is a phrase that can be aptly applied to ASLE. For a partner in it's broadest sense means, "an associate; sharer; participant" . . . . . and that is precisely what ASLE is. ASLE is "an associate" in the truest sense of the word, for the technical organization of the Society is always available to anyone confronted with a problem in the lubrication field. Through the technical organization of ASLE, industry has at it's fingertips countless years of engineering experience and background. As a "sharer," ASLE readily makes available through it's publications and meetings valuable information, thereby providing a forum for the exchange of information. As a "participant," the Society becomes directly involved by conducting programs and activities which will bring forth the scientific information that is needed and desired.

In recognizing the educational and scientific nature of such bodies as ASLE, the government grants a not-for-profit status. This does not mean, as some people might think, that these programs and activities can be conducted without money. On the contrary—this does cost money and industry should support such activities! Think what this would cost if each company were required to conduct it's own affairs individually, without the "partner" assistance from technical engineering societies and scientific bodies.

The financial support of groups such as ASLE comes from many sources. Among them are membership dues, sales of publications, advertising revenue and miscellaneous sources. Individual membership dues seldom ever cover the services that are offered; therefore, it is necessary to look for other sources of revenue. It would seem that the logical place to first look would be industry itself. For all activities and programs are conducted for the sake of industry and any benefit that an individual member may receive is used to make industry more productive and more efficient. The receipient of the services should be those who "pay the freight."

With this thought in mind, ASLE is now organizing an Industrial Membership campaign with a two-fold purpose. (1)—to make industry aware of the services that are available; (2)—to seek financial support to continue and expand these services. The immediate goal of the Industrial Membership Committee is 200 members. With approximately one thousand companies represented in ASLE's membership, this indeed, seems most reasonable. When you, as an individual member of the Society stop and review the work that ASLE is doing, ask yourself this question, "If my company is not an Industrial Member of ASLE, why not?" Perhaps, it is only because they are not enlightened as to why ASLE is in business. We will be glad to tell you and them.

L. O. Witzenburg
President, ASLE

THE LUBRICATION ENGINEER IN ACTION

Report No. 3—

STUART L. McDONIEL
at the Metropolitan
Sanitary District of Greater Chicago

Back when industrial lubrication meant black oil and a lubrication laboratory consisted of a viscosimeter in a cupboard, "Stu" McDoniel got his start in lubrication engineering as a trainee. At the rapid pace of technological progress today, this really wasn't too long ago, but Stu does remember cooking, cooling and cutting his own block grease for rolling mill bearings. Since then, he's been continuously engaged in both the study and application of lubrication engineering.

As a matter of fact, aside from a little week-end golf, he spends most of his "hobby" hours just keeping up with lubrication engineering developments. And yellowed copies of minutes from the first founding meetings of the ASLE testify to the fact that he's done much more than just keep up. Stuart L. McDoniel has been in charge of lubrication engineering at the Metropolitan Sanitary District of Greater Chicago since 1946 and lives with his family, a son and four daughters, on Chicago's South Side.

When old King Augeas wanted his barn cleaned out, the fabulous Hercules turned a river from its course and finished the job in a day. In Chicago, the designers of the sanitary drainage and disposal system turned a river too, and the world has accorded them almost equal fame.

The system of the Metropolitan Sanitary District of Greater Chicago is recognized high on the list of the world's engineering wonders. And it's no one-day wonder either. Safeguarding the health of more than 7,000,000 people in an area of approximately 870 square miles is a vital function that goes on endlessly. As a matter of fact, continuity is the very essence of sanitary district operation. It would be hard to conceive of any other service where interruption would lead so quickly to far reaching and disastrous results.

This essential emphasis on uninterrupted operation is what actually brought modern lubrication engineering, in the person of Stuart L. McDoniel, onto the scene at the Chicago Sanitary District.

STUART L. McDONIEL

View overlooking A and B Batteries, showing Final and Aeration Tanks —Southwest Sewage Treatment Works.

In 1946, after many years of truly Herculean labor, the tremendously complex array of equipment that handled well over a billion gallons of waste daily was beginning to creak and groan. From conveyor bearing to air blower and from pump packing to pillow block, there were signs of serious wear. Keeping the system in operation became almost as pressing a problem as the original task of designing and building the system had been.

Characteristically, in the way that has made the management of Chicago's Sanitary District a model for efficient municipal administration throughout the country, the men in charge quickly pin-pointed improved lubrication practices as one of the basic needs and sought expert, experienced help. Stu McDoniel got the call.

To evaluate what McDoniel did, it is necessary to have some idea of the magnitude of the sanitary district operation today, remembering that just one lubrication engineer specifies, tests and is responsible for all lubrication. As mentioned earlier, the system handles well over a billion gallons of waste per day, draining an area of 870 square miles. Approximately 2,300,000 gallons of lubricants and fuels are required yearly.

Three main treatment plants, each including pumps, blowers, generators, turbines, valve and flow control equipment, conveyors, material handling machinery, automotive equipment and miscellaneous maintenance machinery, are involved. Then to all this is added considerable rolling stock and diesel engines, dock facilities, lock installations and a network of outlaying pumping stations and small treatment plants.

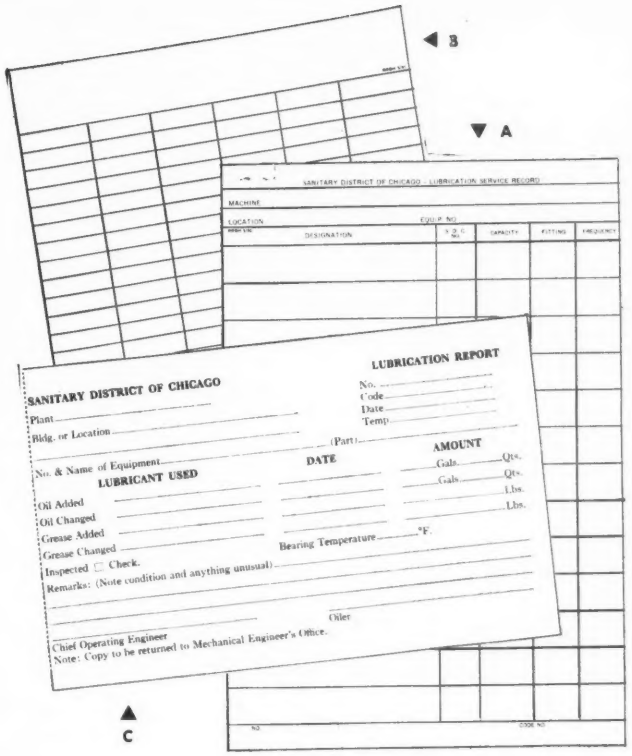
In the main West-Southwest Works alone, the centrifugal blowers compress 780,000 cubic feet of air per minute, total pumping capacity is approximately 1.2 billion gallons daily with huge 300 cfs pumps and high pressure turbo-generators produce 20,000 kva of power. Other equipment includes a battery of 98 vacuum filters for sludge dewatering, 14 sludge drying units, 7 steam generators delivering 70,000 to 110,000 pounds of steam per hour each and coal handling and crushing equipment to meet the plant's 800 ton per day requirement.

In all, more than 11,000 individual pieces of equipment, excluding motors, require special lubrication attention. And when Stu McDoniel came into the picture assigned to the West-Southwest Works only, well over 100 different types and grades of lubricants were in use.

His approach to the problem was abrupt and dramatic. Within 10 days after being placed in charge, even before having a chance to see how staggering were the difficulties, Stu had reached into his bag and drafted up a complete program for administrative approval. Incidentally, this original program was so basic and sound that it is still in effect, virtually unchanged, today.

Seven objectives were outlined in the program:

1. Utilization of a simple internal classification system for lubricants.
2. Posting of detailed lubrication charts.
3. Establishment of a card index follow-up system to insure effective lubrication.



Samples from card index follow-up system used to insure effective lubrication.

A—Kardex file cards for recording lubrication frequency. Equipment data on the back side of this card remains in the file permanently.

B—Other half of Kardex file which carries the dates of equipment servicing, and is renewed when card is filled on both sides.

C—Oiler's daily report form.

4. Routine testing and analysis of incoming materials.
5. Preparation of monthly cost and consumption reports.
6. Establishment of efficient storage and handling procedures.
7. Institution of a training course for all personnel in good lubrication practices.

Approval for this program came quickly, once again typical of sanitary district management efficiency, and, with the full cooperation of all engineering, operating and maintenance departments, the plan was put into effect and completely set up within the short space of two years. Today, lubrication procedures and schedules for each individual piece of equipment are spelled out in terms of McDoniel's SDC (Sanitary District of Chicago) Number classifications.

Further, the system provides for complete follow-up and reporting with more than 100 maintenance oilers working full time in accordance with predetermined schedules. A fully equipped lubricants testing laboratory checks all incoming materials and the program has been extended to service the entire sanitary district.

As a completely independent municipal organization operating under the laws of the State of Illinois, the Metropolitan Sanitary District of Greater Chicago is governed by a board of elected trustees and staffed by more than 2,000 full time employees. Operations are generally divided into the engineering department and the department of maintenance and operation.

Within this structure, although working closely with the engineering department on many projects, the lubrication engineer reports directly to Philip Furlong, the Engineer of Maintenance and Operation. The actual lubrication engineering function is supplemented by two technical field assistants, who help cover the large area of the district, and two clerical assistants.

All of McDoniel's activities have two fundamental objectives. One is to maintain control of the huge system, the other is to assure continuing improvement. A special card file is the heart of the control set-up.

This file is absolutely essential due to the unusually broad variety of types of equipment that must be lubricated and the unusually large area over which the facilities are spread. In the file there is a separate card for each individual piece of equipment requiring lubrication, detailing the established procedure and oiling schedule and providing for a running log of lubrication activity.

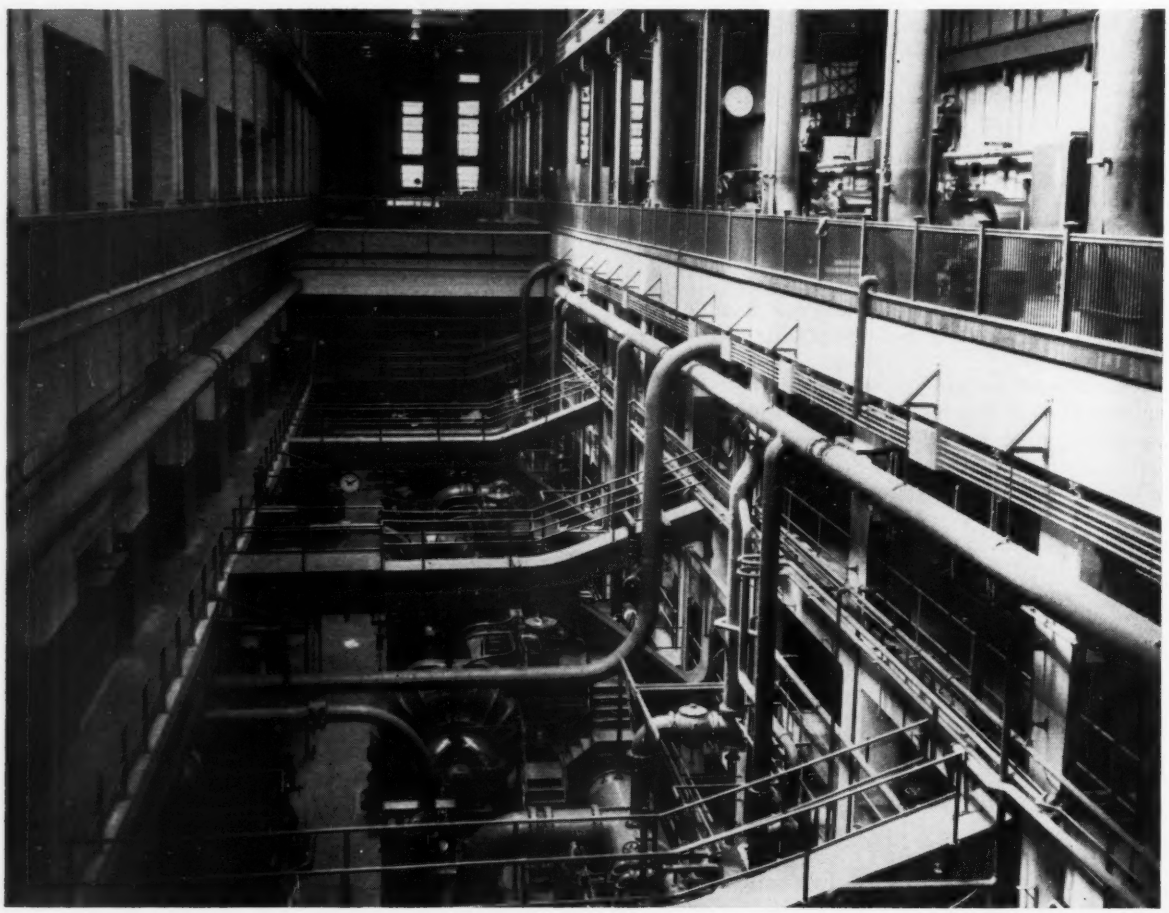
It is the accuracy and completeness of this file, together with constant emphasis on keeping it up to date, that enables McDoniel to "stay on top" of the lubrication situation—to keep it running as he set it up and labored to get it going.

Special forms, supplied to all oilers in pad form, are filled out every time any piece of equipment is lubricated. The information from these forms, returned to the lubrication engineer's office, is entered on the equipment file cards. It should be noted here that, despite the importance of these detailed reports on actual lubrication activity, the oilers are a part of the maintenance and operating group and do *not* report to the lubrication engineer. Rather, the lubrication engineer is in a staff capacity to recommend and instruct but is relieved of responsibility for direct supervision of personnel.

One of the primary and most obvious applications of the lubrication file is compilation of a periodic "punch" list. Each month, every card in the file is reviewed to make certain that all required activity has been completed and reported. Discrepancies are noted, comprising the "punch" list, and appropriate memoranda are issued to the supervisors concerned.

Another interesting sidelight on the lubrication card file, and one that proves its completeness and ac-

300-C F S Main Sewage Pumps—Southwest Sewage Treatment Works



curacy, is its application to portable equipment. In an operation as wide spread as the sanitary district, items of portable equipment such as mobile pumping units, portable hoists, motor-generator sets and the like have a way of getting misplaced somewhere just when they're needed most.

However, with a constant flow of reports from oilers ranging into every corner of the district, it developed that McDoniel was the man who knew where everything was at all times. Consequently, as a corollary assignment, the lubrication engineer maintains a special manual on the location and availability of all portable equipment. It's a direct outgrowth of the lubrication card file system.

To assure continual improvement of the system requires somewhat more complex activity. Testing, development of new specifications and even close technical cooperation with the engineering division of the district are all involved. In connection with this latter phase of activity, the lubrication file cards list critical mechanical details of various types of equipment such as bearing types, sizes and tolerances.

Such data was particularly valuable just recently when it became desirable to vary the speed of one of the big 300 cfs pumps in the interest of achieving more sensitive control of flow rate through the treatment process. Low speed lubrication characteristics of the main bearings were critical and the lubrication engineer was able to devise and recommend safe procedures with a minimum of delay.

Another example of the importance of close cooperation with the engineering section in continually improving the maintainability of sanitary district equipment involved frequency conveyor bearings. These bearings had a long history of short life due to the unusual stresses to which they were subjected and difficulty in keeping them adequately lubricated.

Repeated failures were clearly the result of inadequate lubrication, which put the problem squarely in McDoniel's lap. Yet, the answer was not a revision of lubrication procedures.

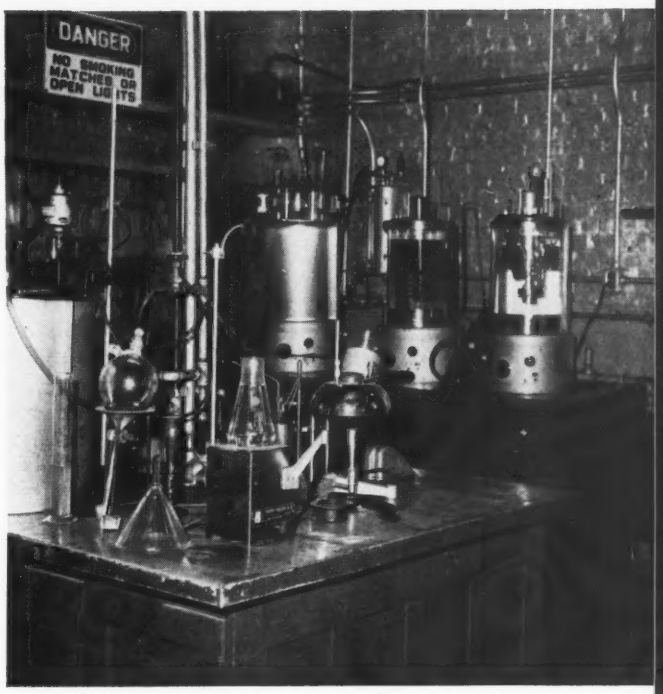
Rather, at the recommendation of the lubrication engineer, the bearing mounting arrangements were modified to eliminate the lubrication problem.

In addition to this sort of technical interchange with other departments, the completely equipped lubricants testing laboratory and very close cooperation with suppliers both play major roles in the improvement of lubrication practices.

The primary purpose of the laboratory is to test all incoming materials against sanitary district specifications and to check all materials in use to determine performance standards and optimum replacement times. All laboratory reports, both on incoming materials and materials in use, are carefully filed on standard forms and periodically reviewed.

In this way, any significant or unusual events are detected before serious damage to equipment can occur. Also, established specifications are subject to continual checking and revision as may be indicated on the basis of actual field results.

The specifications in use, coded by special SDC numbers are the result of years of testing and modification. This close attention to specifications and constant enforcement of strict compliance has produced really significant economies.



One corner of the 2-room Petroleum Laboratory—Southwest Sewage Treatment Works

Where 108 different lubricants were in use when the lubrication engineering program was started, there are now only 33 different active SDC specifications. These cover both winter and summer grades where required, and the range of application is considerably broader than it was 14 years ago, too.

Supplier cooperation comes into play mainly in the development of new specifications and the preparation of special new materials for test. Although all procurement is handled by the office of the Chief Clerk of the district, McDoniel works closely with the research and development staffs of virtually all of the major lubricant suppliers.

Procurement is always in accordance with SDC specifications and the compliance of various brand name items with applicable specifications is certified by McDoniel. In this way, preferential purchasing by brand is carefully avoided and purchasing can be kept on the most efficient possible competitive basis.

Continuous laboratory testing and supplier research cooperation has made the SDC number system extremely reliable as a guide to safe application. An illustration of the confidence placed in lubrication engineering recommendations in sanitary district operation is the case of the chewed up sludge pump bearings.

In these pumps, it was virtually impossible to shield the bearings from the highly abrasive sludge being handled. Various types of packings all eroded very quickly and bearing life was as short as 18 hours. Because the sludge pumps were on a 24 hour operating schedule, the situation was critical. Bearing replacement was a time consuming job.

After study, aerosol lubrication seemed to offer promise in that it would operate to exclude abrasive material as well as to lubricate the bearings. And on the strength of this possibility, as recommended by the lubrication engineer despite the misgivings of the equipment manufacturer, a trial installation was made. Recorded bearing life on the initial installation is now well over 8,000 hours with no sign of unusual wear and aerosol lubrication has since been applied in a number of other highly abrasive areas. The manufacturer of the equipment has also extended his range of recommended application.

As in this case, hour meters are extensively used to measure lubrication performance and to establish sound lubrication schedules throughout the district.

To round out this account of a lubrication engineer in action, one other observation is necessary. While the magnitude of the job, the speed with which it was brought under control, and the outstanding improvements that resulted may tend to seem amazing, McDoniel would be the last to want his activities to seem unusual. Rather, what has been accomplished is the normal result of recognition of the importance of lubrication and lubrication engineering by enlightened management plus a good job, well done by an experienced man.

THE ASSIGNMENT

As of today, the lubrication engineer of the Metropolitan Sanitary District of Greater Chicago is charged with responsibility for specification, testing and proper utilization of all lubricants, greases, petroleum fuels, additives, soaps and solvents used in the district. Procurement and application, while not directly under the jurisdiction of the lubrication engineer, are carried out in accordance with his recommendations and established procedures.

In addition to being "Johnny on the spot" for all kinds of trouble-shooting assignments as problems arise, Stu McDoniel breaks this job down two ways. First, there is the control operation to make sure that the system functions as it should and keeps on functioning. Second is a program of gradual, conservative development to assure continual improvement and upgrading of lubrication practices.

Then, from a management viewpoint, he has to be able to show evidence of accomplishment in the form of cost analysis and consumption reports. Actually, these are a natural outgrowth of good control and development. The opportunities for savings and improvements in an operation as large as the sanitary district are virtually endless.

A view of oil storage area

Filter Room—Southwest Sewage Treatment Works

THE APPROACH

To get the job done, McDoniel stays close to the seven basic objectives established in his original program. Consistency is half the battle—both in maintaining control and in pin-pointing necessary changes or opportunities for improvement.

Constant attention to detail is essential in the form of periodic test report evaluation and preparation of the lubrication "punch lists" as described earlier. Beyond this, cooperation with both suppliers and other personnel of the district, careful instruction of workers involved in the actual application of lubricants and never-ceasing emphasis on the importance of proper lubrication pretty well define McDoniel's approach.

Supplier cooperation, with careful impartiality, is particularly important. The laboratories of the lubricant producers and processers are the source of the new developments that solve old problems and improve established procedures. Contact with the men who represent suppliers is vital to keep abreast of these developments.

In connection with supplier relations, the specification and identification of all materials used by SDC numbers is extremely important and effective. SDC numbers also greatly simplify internal handling and application.

THE RESULT

For an evaluation of results achieved in the sanitary district operation, one need only refer to the basic objectives established at the start of the lubrication engineering program. All have been achieved and are accepted now as routine procedure:

1. Materials are simply and uniformly classified by SDC number.
2. Lubrication procedures are established, posted and followed faithfully.
3. Performance is assured by a detailed card-file system of reports and follow-up.
4. Complete testing of all incoming lubricants keeps quality at the highest level.
5. Management is completely informed on progress and developments.
6. Special storage and handling facilities have been established.
7. Lubricant application is handled by carefully trained and, ain most cases, specialized personnel.

Without specific reference to countless problems solved and instances of cost saving, ample concrete evidence of results is found in the fact that there has been no failure of equipment due to lack of or improper lubrication for more than three years!

Harking back to the Herculean analogy at the beginning of this story, Stu McDoniel's achievements as a lubrication engineer in action suggest another. For just as industrial leaders are gradually coming to recognize the tremendous expense of haphazard lubrication practices, the growing corps of specialists in lubrication engineering stands ready, like a modern Hercules, to help slay the many-headed cost monster.

Emulsifiable Rust Preventives

Howard B. Carpenter,

Senior Engineer, Esso Standard, Division of Humble Oil and Refining Company, New York City

Emulsifiable rust preventives furnish protection equivalent to that provided by light solvent cutback rust preventives and at a lower cost. In addition, they neutralize corrosive fingerprints and absorb water when applied directly to a wet surface. Application is made by dip or spray. They are particularly well suited for the indoor protection of ferrous metal surfaces or parts that are to be packaged for shipment.

Emulsifiable products are the latest development in the field of petroleum base rust preventives, particularly those designed for the indoor protection of ferrous metal surfaces or parts which are to be packaged for shipment. The protection furnished is equivalent to that provided by light solvent cutback rust preventives and at a lower cost. In addition, they neutralize corrosive fingerprints and absorb the water when applied directly to a wet surface. Application is made by dip or spray. Except in special cases, the film does not have to be removed before the part is put in service. Where removal is necessary, it is easily accomplished by the use of a petroleum solvent.

Petroleum base rust preventives, as they are known today, have been marketed for about 20 years. Prior to that time oils, greases and petrolatums were used for the purpose, but their performance was erratic. Then came the era of inhibitors, and additives were found which transformed basic petroleum products into dependable rust preventives. Materials in this general category afford temporary or semi-permanent protection. They are characterized by (1) ease of application, (2) films which do not dry hard in the manner of paints, (3) the ability to expand and contract with the metal, and (4) ease of removal. In most cases, the films are good lubricants and compatible with conventional lubricants.

The first group of petroleum base rust preventives to attain prominence was known as the hot-dip type. The base contained a good percentage of petrolatum or microchystalline wax. Heating or thinning with a solvent was required for application. These products provided excellent protection, both indoors and out, but the relatively thick, grease-like film was objectionable.

Presented before the 14th ASLE Annual Meeting, Buffalo, New York, April, 1959.

Oil type products were the next group to receive attention. These consisted of lubricating oils plus rust inhibitors and were used primarily for the classes of application which require the product to be a good lubricant as well as a rust preventive. The interior surfaces of internal combustion engines provide a good example.

Later, these two classifications were augmented by the solvent cutback type. Film forming materials into which rust inhibitors have been incorporated are dispersed in a petroleum solvent. Some are designed for outdoor protection, while others serve only for surfaces sheltered from the weather. Application is accomplished without heating and this together with films which in general are unobjectionable have contributed to the growing popularity of this type.

More recently, petroleum base rust preventives of the emulsifiable type have come on the market. The potential fire hazard that is sometimes associated with solvent cutback products, although more imaginary than real, has stimulated their development. Lower cost has also been an attractive feature. Products of this type furnish excellent indoor protection. In addition, they not only neutralize corrosive fingerprints previously applied, but provide a film which affords reasonable protection against this type of damage during subsequent handling. They may be applied directly to surfaces that are wet with water or with soluble cutting oil emulsions. In such cases they do not displace the water in the manner of certain thin-film, solvent cutback rust preventives,—they absorb it. Application is made by conventiolal methods and, except in unusual cases, the films do not have to be removed before the protected part is put in use. Fig. 1 shows a bucket of small parts being removed from a dip tank. In this case, the emulsion was heated to accelerate drying.

In the search for effective rust preventives that could be applied in an emulsion with water, attention was first given to conventional soluble cutting oils used in machining and grinding. These products have some rust preventive properties, but they do not provide dependable protection for any appreciable time. Attempts were made to improve their rust preventive properties, but such attempts were not wholly successful. Efforts were then made to modify proven rust preventives so that they would form stable emulsions when mixed with water. This approach produced satisfactory products of two types. One deposits an oily film, while the other leaves a semi-solid, grease-like film which resists any tendency to run off or to be wicked off by contact with an absorbent packaging material such as paper, cardboard, or wood. Both films are quite thin and transparent. However, if discernibility of the film is of importance, a dye can be added.

Laboratory evaluations have indicated performance at least the equal of that furnished by thin film, solvent cutback preventives and definitely superior to

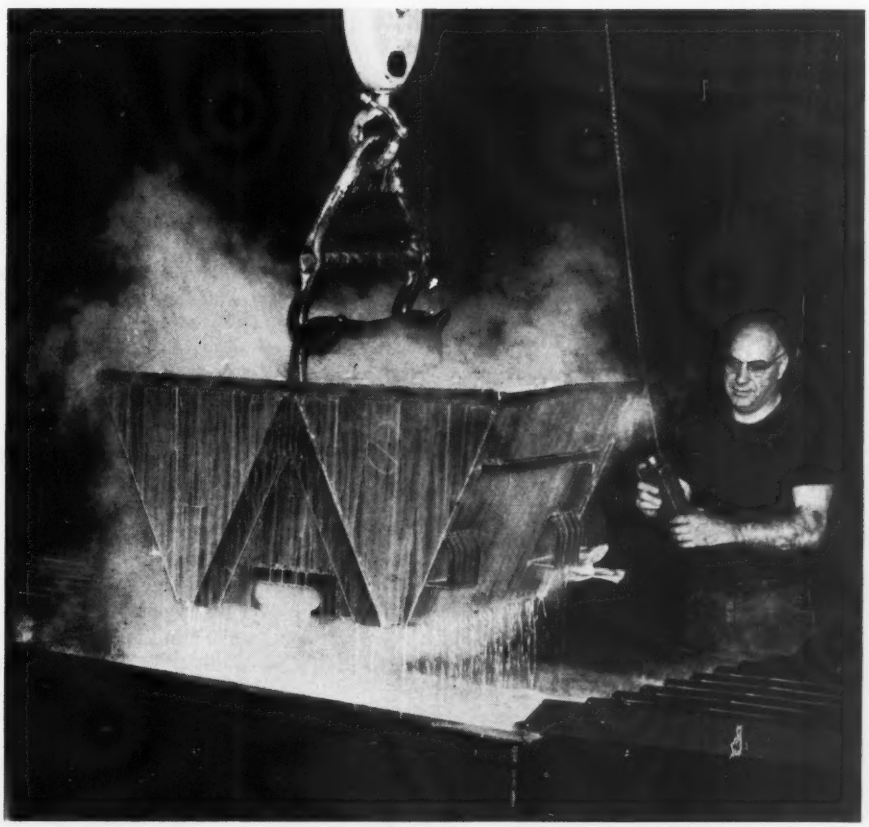


Fig. 1. Dip Tank Application of Emulsifiable Rust Preventives.

that afforded by conventional emulsifiable cutting oils. The data are presented in Table 1.

TABLE 1—Laboratory Rust Tests

Product	Water Ratio	Hours to First Indication of Rust: Humidity Cabinet*	Hours to First Indication of Rust: Salt Spray Cabinet**
A	5:1	600+	600
B	5:1	216	48
C	...	600+	96

Product A = Emulsifiable rust preventive
Product B = Emulsifiable cutting oil
Product C = Thin film, solvent cutback rust preventive

*JAN-H-792.
**FED-STD-791 (20% NaCl).

Although emulsifiable rust preventives are not recommended for outdoor protection, steel parts coated with these same three products were exposed to the elements to obtain comparative data. These results are reported in Table 2.

TABLE 2—Outdoor Exposure

Product	Amount of Rust After: 7 days	22 days	35 days
A	None	Slight trace	Complete
B	Complete	...	...
C	Slight trace	Complete	...

The data in Table 3 indicate the relative efficacy of different water ratios of the emulsifiable rust preventive.

TABLE 3—Effect of Water Ratio on Rust Protection

Water Ratio	Humidity Cabinet Life* (Hours to First Indication of Rust)
4:1	1000
7:1	456
11:1	336
14:1	216

*JAN-H-792

In another test, the humidity cabinet results of different water ratios of both the oil film and the semi-solid film types were compared with an emulsifiable cutting oil. The data are reported in Table 4.

TABLE 4—Effect of Water Ratio on Rust Protection

Product	Water Ratio	Hours to Failure* (Two Panels Each)
D	5:1	600, 600
E	5:1	864, 912
F	5:1	24, 24
D	10:1	336, 504
E	10:1	864, 912
F	10:1	24, 24
D	50:1	3, 5
E	50:1	1, 21
F	50:1	1, 21

Product D = Emulsifiable rust preventive—oil film type
Product E = Emulsifiable rust preventive—semi-solid film type
Product F = Emulsifiable cutting oil

*JAN-H-792

Needless to say, the results with the 50:1 mixtures are meaningless, as any product failing in 2 to 3 days or less cannot be considered to have dependable rust preventive properties.

These laboratory results have been substantiated by field tests and use in actual production.

Emulsifiable rust preventives are usually mixed in a ratio of 1 part of product to between 5 and 10 parts of water. Application may be by dip or spray at normal room temperature, although under certain conditions the dip tank is heated to 160-170 F. to accelerate drying. The additives inhibit the corrosive action of the water until it evaporates, leaving the protective film. With parts that are to be packaged, the water must be completely evaporated before packaging. Drying may also be accelerated by exposing the coated surface to a heated atmosphere.

In service, the water/oil ratio may not remain constant. Part of the water may evaporate from the dip tank or additional water may accumulate from wet parts. Consequently, the ratio should be checked from time to time. The best way to check the ratio is to add sulfuric acid or magnesium sulfate (Epsom salts) to a measured sample of the emulsion in a graduate. The acid or salt breaks the emulsion. Liberated oil floats to the top of the graduate and can be measured quantitatively in relation to the water. From the ratio of water to oil in the sample it can be determined whether to add either more product or water to bring the emulsion back to its proper concentration.

Since the residual films are lubricants in their own right and are compatible with conventional petroleum lubricants, removal is often unnecessary. However, when desired, the film is readily removed with a petroleum solvent.

In conclusion, we wish to emphasize the fact that emulsifiable petroleum base rust preventives are effective, economical, and eliminate the fire hazard which sometimes is associated with solvent cutback rust preventives.

INFRARED HOT BOX PROTECTION

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For years the railroad industry has been afflicted with an operational problem which has drained millions from their profits every year. The "hot box" is a term used to describe an overheated bearing which on occasion may lead to derailment of a train.

The text describes a unique detection scheme to discover the dangerous bearings on a freight train while the train is in transit. The principles and components of the detection system are described in detail. The system applications and its economic considerations are outlined.

INTRODUCTION

For those who may be unfamiliar with infrared (abbreviated I R) phenomena, a few comments relative to the nature of the infrared section of the electromagnetic spectrum will be made in order to provide a better basis for understanding applications of the hot box detector.

In 1800 Sir William Herschel (1) discovered the existance of the infrared spectrum while conducting an experiment with visible light. This discovery closed a gap in the electromagnetic spectrum between wave lengths visible to the human eye and the radio waves which were then known to exist.

Herschel's discovery spurred research in the detection and measurement of the infrared wavelengths. These efforts were somewhat hampered by the lack of sufficiently sensitive detectors; nevertheless, a great deal of work was conducted in the first half of the 19th Century on the development of infrared detectors. Thermocouples and thermopiles were the standard detectors of the day. The numerous detectors and sensors of electromagnetic energy used today are evolved from these early works. The limitation of this discussion does not permit a detailed description of these detectors but a few will be mentioned in their general classifications.

Any body above absolute zero (−273°C) has energy and will radiate some of this energy to its surroundings. The radiated energy is proportional to the fourth power of the absolute temperature of the body. In a like manner, its surroundings will radiate to the body. Radiation measurements, then, are concerned with the net radiation between two bodies or surfaces. Everyone has experienced the comfortable warmth of radiation on the side facing a cheery fire while his back was uncomfortably chilled by the radiation from the surface to its cold surroundings.

The character of a heated target must be described in some radiation term of reference. This reference is known as a "black body." By definition, a black body is one which is in thermal equilibrium with its surroundings and radiates all the energy which it receives. It is the perfect absorber of all incident radiation and also the perfect radiator of this incident radiation.

Black body conditions are very nearly attained in laboratory apparatus, or, in some cases, in industry. An example of this is a view into an open-hearth furnace through a small aperture just before the heat of steel is poured. In this example, one would not be able to distinguish the difference between the molten steel and the walls of the furnace.

It is because most bodies do not have black body characteristics which gives rise to color for the body. For example, a red article does not absorb the red spectrum but reflects it instead.

Since most heated bodies are not black bodies, they emit radiation as a fraction of the black body at the same temperature. They are consequently sometimes referred to as "gray bodies" and their percentage or fraction of black body radiation is called "emissivity" or "emissivity factor."

The conclusion may be drawn, from the black body discussion, that two targets of the same material at the same temperature, but having different surface properties, will radiate energy in different proportions. Thus, taking a temperature measurement by infrared pyrometry, the emissivity of the target must be known.

Wave lengths in the infrared spectrum are measured in a unit of length known as the micron, which is equivalent to 1×10^{-4} centimeters. Fig. 1 illustrates

the electromagnetic spectrum and the location of the infrared band. It will be noted that the infrared spectrum is wide when compared to the visible spectrum, which extends only from 0.4μ to 0.7μ. Because of its breadth, the infrared band is arbitrarily divided as follows:

0.70 to 1.5 microns = Near I R
1.5 to 10 microns = intermediate I R
10 to 1000 microns = far I R

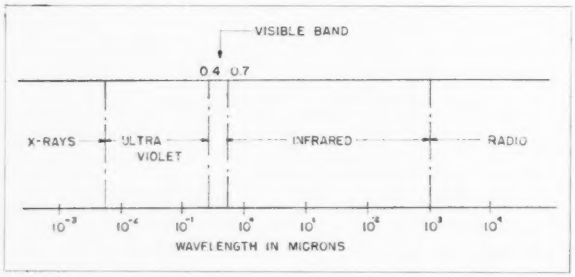

Fig. 1. The Infrared Band.

Notes that 1,000 microns (or 0.1 centimeter) is about the upper limit of present day microwaves.

All detectors of infrared do not respond uniformly to the above wave lengths. Therefore, a detector must be chosen which responds best to the radiation characteristics of the target. This leads to the classification of available infrared detectors into two general categories; the photo detectors and the thermal detectors. The mechanism of operation for the two groups is somewhat different. Photo detectors include a number of widely used photo cells which depend upon the number of quanta of radiation absorbed to give the photo electric effect and are useful when the radiation above certain wave lengths is received from the target. Since the quanta of radiation is inversely proportional to wave length, there exists a cut off wavelength

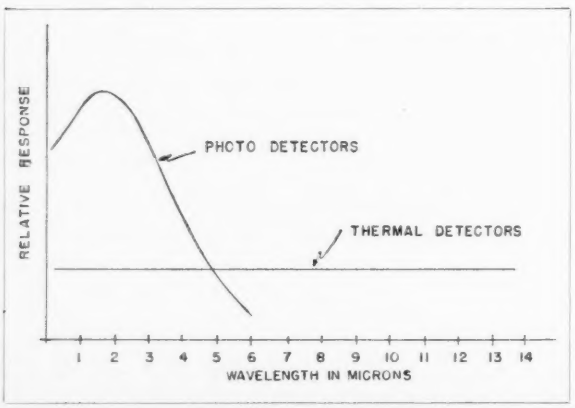

Fig. 2. Detector Element Comparison.

for these elements dependent on the properties of the detectors (2). Thermal detectors, on the other hand, differ in that their response depends on the total energy received regardless of the wave length. In other words, the response depends upon the heating effect of the total incident radiation on the detector element.

Photo detector materials include cadmium sulfide, lead sulfide, lead telluride, and lead selenide, which are useful for detection of wave lengths to above 3 microns but have a sharp cut off characteristics in the intermediate band. Thermal detectors are much more broad in their responses and of necessity require a broad radiation band from the target to obtain good signals. Such broad spectra are inherently generated by most targets (3). Examples of the thermal detectors are thermocouples, metal bolometers, and semi-conductor bolometers. Fig. 2 illustrates the comparative responses of the two detector classifications.

Another consideration which must be given to the choice of a detector is that of the speed of response. On a train passing a detector at 60 mph the journals pass a detector at the rate of approximately 17 journals per second. A detector having a response speed in the order of one second consequently would be useless for this application because of the short length of time the target is exposed. However, if the target were moving very slowly so that the exposure time approached one second, such a detector might be quite satisfactory.

Photo detectors have, in general, extremely fast responses in the order of microseconds but, as mentioned before, the response is limited to wave lengths in the near infrared region. Thermal detectors, while not quite as fast as photo detectors, may be made with responses in the order of milliseconds. To obtain such fast response characteristics, thermal detectors are physically diminutive and are mounted on heat sinks to dissipate heat rapidly.

Before considering the components of an infrared hot box detector, it would be well to mention some of the uses of this medium. Infrared systems have been designed for military applications, such as, missile tracking, missile guidance, and thermal reconnaissance.

In industry, the applications include temperature control of processes in which direct contact with the material may not be convenient or possible. Examples of this are steel mill rolling and fabrication operations and similar operations in the production of plastic film. Infrared temperature controllers are an excellent supplement to optical pyrometers where the temperatures of targets are not high enough to emit visible radiation.

With this very brief high-lighting of infrared, the essential elements of a hot box detector may be considered. These are illustrated in the block diagram of Fig. 3. The scanners located on both sides of the track contain the optics, heat cells, and electronics to convert received radiation from the passing journal boxes into proportional electrical signals. Transducers mounted on the rail mark the position of the journals as they are scanned and govern the signal processing. Each axle will assume the scanning position progressively. Signals derived from the scanners and trans-

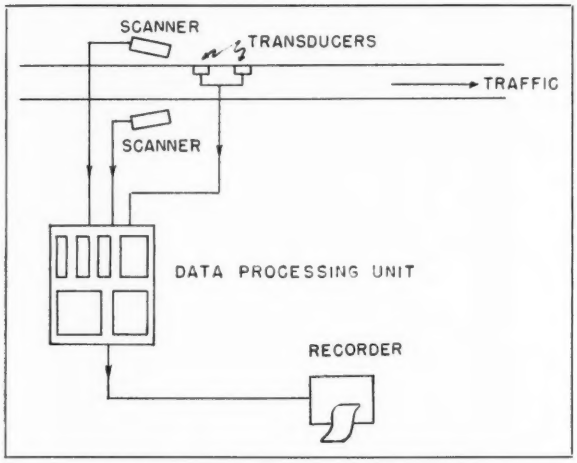

Fig. 3. Hot Box Detecto Block Diagram.

ducers are fed into the data processing unit at wayside where the electronics of the system control sequences and magnitudes of the signal. The output of the processing unit displays on a two-channel recorder a train of pips representing the heat quality of each journal. A reproduction of this tape appears in Fig. 4.

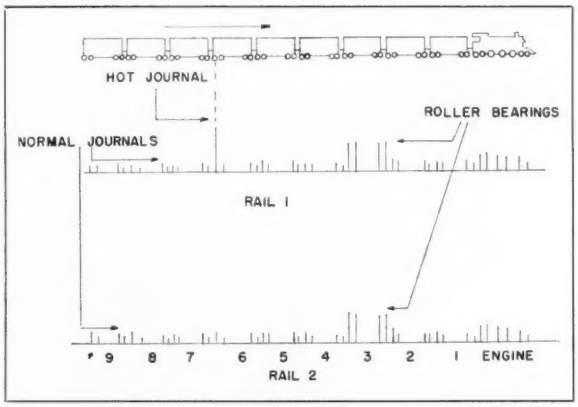

Fig. 4. Diagram Showing Relations of the Wheels and Recorded Pulses.

It may seem from the graph that a temperature measurement of the journal being scanned is possible. This, however, is not the case because of the large number of uncontrollable variables which influence the magnitudes of the heat signals. (4) The graphs, therefore, are not calibrated but indicate the relative quality of journals only. Since it is known that a very large majority of the journals on the train will be normal, it is the indication we receive from these which establishes our reference. Abnormalities appear with a marked departure from this reference.

It must be stated that the actual condition of the abnormal bearing must await the inspection. It is left to the train crew to determine whether or not the journal is in a sufficiently bad condition to set out. The location of the overheated journal, however, is readily determined from the chart.

With these facts in mind, the detector site should be chosen so that a siding is convenient for car set outs. This is especially true if the detectors are to be used on main lines.

APPLICATION OF HOT BOX DETECTORS

A. Demands on the Detector System

Railroad operations puts many demands on the infrared system designed for the detection of hot boxes. It is expected to provide continuous reliable performance under a wide range of variable factors, of which none can be allowed to affect detector operation to the extent that reliability is seriously reduced.

1. *Environmental*

The first variables to be considered are temperature, humidity and weather, which can vary widely at any one point and vary even further at different geographic locations. It is undesirable to have manual adjustments in the system to compensate for these factors, or to require specially designed systems for extremes in temperature and weather. Consequently, the system must adjust itself automatically and be capable of withstanding severe ambient conditions. The present detectors operate evenly over the range of —20F to 130F; they are not affected adversely by high humidities, and operate satisfactorily in heavy fog, rain, dust or smoke. Night time conditions approach the ideal for this equipment.

The second variables to be dealt with are those introduced by the trains themselves. Operationally, it is undesirable to have to control train speeds when they pass over the detector, or to run them over a special track to align the trucks and journal boxes. Further, trains should not have to slow down to reduce vibration in the trackside detecting equipment, nor should the detector be capable of inspecting journal bearings of only one design. Consequently, the present detectors have been designed to accommodate train speeds of 5-70 mph; in addition, they scan journal housing in spite of lateral movement or skewing of the trucks; they can function under the vibration of loaded cars at any speeds, and they are capable of reading all types of journal bearings including roller, friction and sleeve type. Operating experience has proven the detector equal to these tasks.

Further, other heat sources are present on trains, which if sighted by the detector, can cause it to give a false hot box indication. Hot brake shoes, steam lines, hot air blowers, hot water tanks, and many other sources are present to confuse the detector, and must be ignored. Present detectors accomplish this through a combination of circuit discrimination and equipment orientation, so that the vast majority of

spurious signals are not processed through the system.

2. *Flexibility*

In meeting the above conditions, the detector has already accomplished a great deal, but other demands are made on the system by existing railroad facilities. Track clearance regulations must be complied with; the system must not interfere with or be affected by coded track circuits or other signal equipment; it must remain static in electrified territory in the presence of high voltage power lines. External electrical influences unique to the location must be dealt with (for instance, neon signs radiation RF energy, or factories putting sporadic power drains on AC power lines shared by the detector.) These problems have been overcome to a large degree.

B. Remote Location of Detectors

As it is not always possible to locate detectors near a signal tower or terminal, thought must be given to the operation of the system at remote sites. Accordingly, for the remote transmission of detector signals, it is possible to apply carrier channels extending the distance between the recorder and the trackside equipment to 40 miles over open wire lines or to 15 miles over cable without using repeaters. Carrier has been applied successfully by several railroads at a number of their installations.

C. Serviceability

Consistent with railroad practice, the detector must not be so complex that it cannot be readily serviced. A defective equipment must be repaired rapidly, particularly where it effects trains movement and/or is directly tied in with the signal system. Present detectors are designed to facilitate this service, so that when it is necessary, it can be performed simply and effectively. Figs. 5 through 8 show some of the major components of the Hot Box Detector and illustrate its "plug-in" module construction.

D. Other Factors Influencing Hot Box Detection

1. *Time Variations in Development of Hot Boxes*

Hot boxes do not develop in a known or fixed period of time. Depending on train speed, the car loading, the nature of the journal bearing defect, and other factors, a hot box can develop in a very short time or over an extraordinary long period. One railroad ran tests in early 1956 with the purpose of deliberately developing a hot box, and after running over 90 miles, during which time more and more waste was removed at intervals, the journal still ran cool. On the return trip, all the waste was removed, and still the train proceeded for 20 miles before the journal temperature began to rise quickly to dangerous levels.

This instance is mentioned to illustrate that, at any given inspection point along the

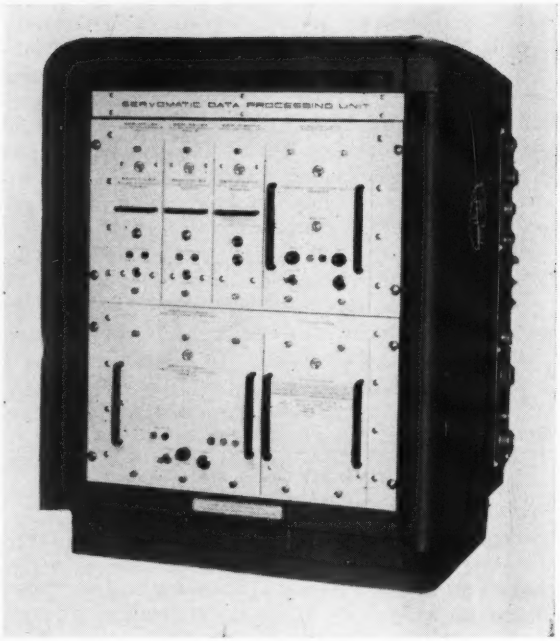

Fig. 5. Data Processing Unit.

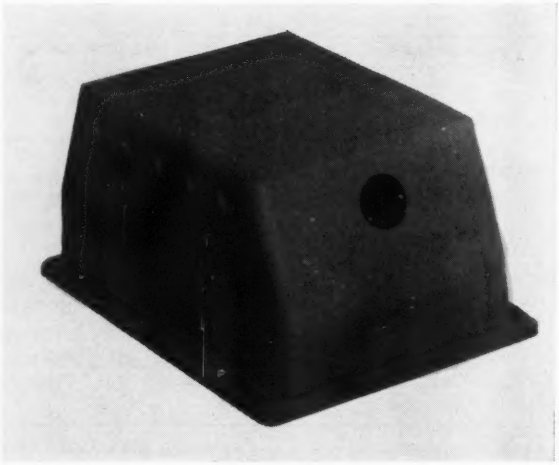

Fig. 6. Scanner.

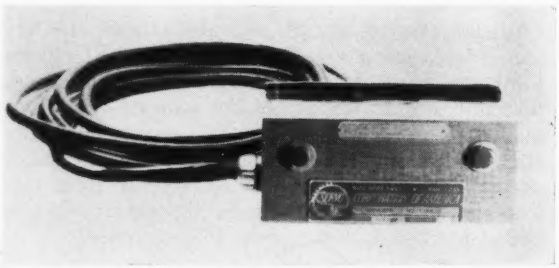

Fig. 7. Wheel Transducer.

right of way, a dangerous condition can be undetected since a journal can inexplicably stabilize at an abnormally high but not dangerous temperature. Obviously, this necessitates that detectors be placed at strategic intervals along the track if it is desired to catch 100% of the hot boxes, as inevitably some hot boxes will get by if only one or two detectors are used, particularly on long stretches of track.

2. *Lack of Consistency in Hot Box Occurrence*

The hot box also does not choose to occur consistently at the same points through the years, so that the records of most roads reveal hot boxes have occurred practically on every section of their track. This is attributed again to many factors, including the effectiveness of car maintenance in certain areas, (4) rough road bed, abrupt stops or car coupling between terminals, and so forth.

However, one pattern does show up which is promising on a percentage basis; namely, that many hot boxes do occur within fifty miles of the originating point. Here again, car maintenance in the originating yard can contribute to this pattern, but more important is the acknowledged effect of car classification on the journal assembly. Car coupling at excessive speeds can cause waste grabs, cocked bearings, and dislocation of lubricating pads, and can undo the effects of the best car maintenance procedures. But again, there isn't any single cause for hot boxes. The hot box is entirely unpredictable and can occur as disastrously one hundred miles out of a yard on a non-stop run, as twenty miles out on a local.

Fig. 8. Recorder.

3. *The Human Element*

Finally, there is the one element which cannot be avoided, in spite of all precautions, the human element. This is introduced into infrared hot box detection through: (a) the operator of the detector and (b) the train crews who must check on the journal question.

The operator of the detector must read the recording carefully on the passage of each train. He must interpret the recording to the extent that high roller bearings and engine pips must be ignored, and he must discern the single or random high pips among the normals which signify the hot box. Having stopped the train, he then must count the car spans, as shown on the recording, to locate the exact car and journal in question. Thus error can be introduced either through misinterpretation or miscount.

Similarly, the train crew, on receiving the information from the operator, must walk to the car indicated. The trainman must then inspect the journal closely by opening the lid and examining the contents. It is then up to his judgment as to whether the journal is in condition to proceed. Here, error can be introduced again by miscount, but more often, inadequate inspection of the journal box leads to the trouble. A thermal hand-check or visual external inspection for signs of smoke is not enough for positive proof, since countless times dangerous conditions have been discovered inside a box when its external temperature did not feel or look dangerous.

Unquestionably, the procedure is a matter of training and, equally important, of gaining the confidence of the men involved in the new equipment. It must be understood that total reliance on old methods in dealing with hot boxes is not adequate, just as total reliance on new methods also falls short. No attempt is made to supplant human intelligence but rather to supplement it.

APPLICATION EXPERIENCE IN PRACTICE

A. Approach to Yards

One of the most successful applications for hot box detection equipment has proven to be for inspecting freight trains coming into yards. Here, the detector equipment is located about 3-5 miles outside of the yard and the journal signals are transmitted to the car maintenance supervisor, who views the recording prior to the train's arrival. The supervisor then has time to examine the tape to discover all abnormally hot journals, locate their positions exactly in the train, and instruct his car inspectors to investigate and service all suspicious journals and take the necessary corrective action in a relatively short period of time. An added advantage to this inspection method is that if the car inspector has other duties to perform

first, a permanent record remains of each train's abnormal journals, and as long as the train is not broken up, it may be attended to later. No longer is it necessary to inspect the train immediately on its arrival in the yard, before the journal boxes have time to cool.

Certain requirements have to be met for this type of installation. The best results are obtained from the equipment if the trains are moving over 10 mph, and the detection equipment is not reliable for train speeds under 5 mph. Also, the detector should not be located in an area where heavy braking occurs, since sparks from the wheels can give false heat readings. Often the hot box detectors have discovered dragging brake shoes on main line trains which gave off a shower of sparks. Finally, the detector should not belocated near a curve, cross-overs, or slanted track, where the trucks might become cocked or be subjected to extreme lateral movements. Since the detector has a relatively small field of view to avoid seeing other heat sources, the above extremes could cause the detector to partially miss a journal box, thus giving an insufficient head indication.

It is significant to review some of the advantages of this inspection method over conventional techniques. First, there is a great improvement in the speed and efficiency of journal inspection, enabling men to perform duties other than the tedious "thermal hand check" required before. Secondly, it permits selective servicing of these journals since only the abnormally hot ones need attention. Thirdly, trains may stand in the yard indefinitely before inspection as their heat profile has been recorded permanently. Finally, a great many abnormal conditions are discovered that might otherwise go undetected. Take for instance, the journal running hot, but not dangerously hot, which might have a small waste grab, a scored journal, or low oil in the box. How long would that journal stand up on its next run if allowed to proceed. The question is problematical, but certainly, a good percentage of hot boxes occuring on outgoing trains are caused by conditions that existed when that journal entered the yard. By culling out these trouble-makers consistently, it can be logically assumed the incidence of hot boxes will be reduced.

Installations such as this have had considerable success on many American Class I railroads.

B. Interin Inspection

The location of detectors at intermediate points between terminals to improve train inspection at scheduled stops has proven to be most successful. One railroad company installed detectors at an interim inspection point for this purpose, and selected a test train to determine the effectiveness of this new procedure. This train was scheduled to make a 600 mile run in about 15 hours, and the inspection point was approximately the half way point. Prior to use of the detectors, the train experienced 25 hot boxes over the second part of its journey after having been completely inspected by conventional methods. These figures were developed over a six month period, and it it interesting to note that the train was allowed to stop only for 15-20 minutes in which time every journal had to be checked and the bad cars set out. One can imagine the work force needed to thoroughly perform this operation on the 150 cars involved within the time allotted! During a similar length of time, the same train was inspected by the detectors, and car inspectors were instructed to investigate only those journals which appeared abnormal on the recording and to leave the remaining journal untouched. As a result of this method, the hot boxes occuring after this point were reduced to two, a reduction of 92%.

This seems to substantiate the theory that many journals contain abnormalities at inspection points which go unnoticed and cause trouble later on. By correcting these conditions, hot boxes can be reduced.

The example indicates there is much to be gained from this inspection method both from the point of view of reducing main line hot boxes and by improving the efficiency of work forces assigned to interim inspection points. It may even prove economically possible to increase the number of such inspection points on long hauls without increasing the size of existing work forces, and make it possible to effectively control all hot box set-outs between certain points. The benefit of such a condition to shipping schedules would more than justify the reassignment of personnel to the critical areas.

C. Main Line Inspection

For adequate protection against hot boxes between terminals, detectors must be placed at frequent intervals along the right of way, since the unpredictability of hot box occurrence does not permit full coverage with only one detection point. Recently, one road had an experience with a single installation where a hot box was detected, giving a 21 mm deflection. As the train slowed down in response to the operator's signal, the journal burned off, derailing the train before it had completely passed the detector.

In placing equipments, the first detector should be about 25-30 miles outside the originating yard to allow journals to come up to normal operating temperatures and to give time for this heat to reach the outside of the journal box where it can be monitored. A second detector should be placed another 20-30 miles beyond the first, with the purpose of catching any journals whose temperatures have risen noticeably since passing the first detector. At all points detectors should be convenient to sidings. It would be advisable to locate the recorders of both equipments at a point where the same operator can compare both recordings, so he can notice any temperature increases from one point to the other. This could prove to be the most reliable way of determining whether the temperature of a suspicious journal had stabilized or was on its way to dangerous levels.

Successive checks on a train between terminals assures that hot boxes do not have time to

develop to burn-off stage, and in many instances, extensive damage to bearings and journals can be prevented. A typical detector installation is shown in Fig. 9.

To accomplish this, a wide variety of equipments can be used, depending on the desires and operating procedures of each road. In some instances, it may be desirable to control signals automatically, providing a digital readout for the use of the train crew. In Centralized Traffic Controlled territory, automatic signal controls can be combined with a recorder in the dispatcher's office, so that the signal can be reset by the dispatcher after he has checked with the crew as to the nature of the trouble and the corrective measures taken. Another possibility is to have only a recorder at the dispatcher's office, where the signal would be set manually and the crew given instructions by telephone. Any of these methods are possible and their applicability depends on existing facilities and procedures. In almost all cases, the use of the recorder has been beneficial, since it provides a permanent record of the heat profile of each train and permits the operator to detect abnormally hot journals, which may not be dangerous, but which contain conditions which should be corrected. Equally important is the information the recording gives regarding operation of the detector itself, pointing up malfunctions, such as defective transducers, misalignment of scanner, or failures within the circuits.

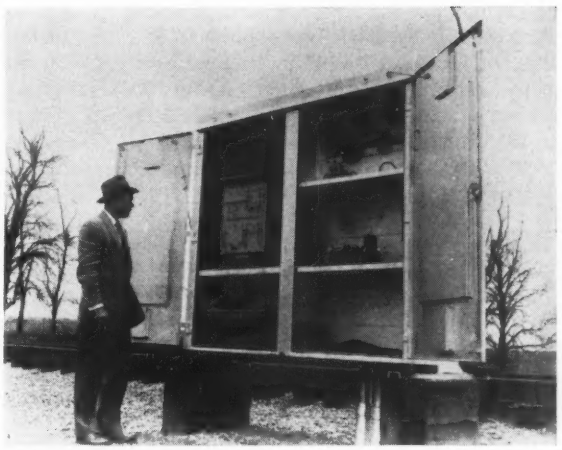

Fig. 9. Typical Hot Box Detector Installation.

D. The System Application

Taking the three general classifications above, consider the ideal disposition of detectors along a typical 200 mile stretch of single track, as shown in Fig. 10.

At both ends of each terminal, detectors are used to inspect incoming trains, and between terminals detectors are spaced every 25-30 miles. At the

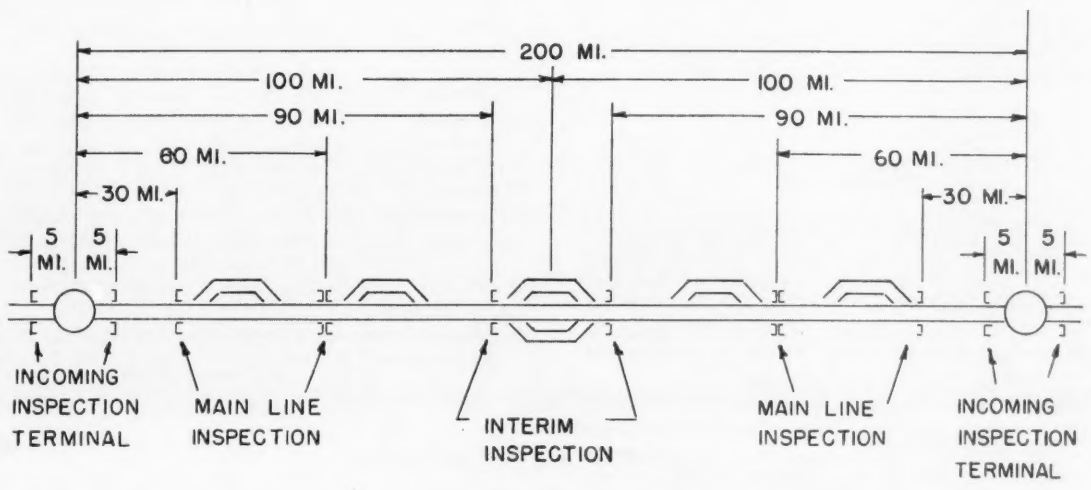

Fig. 10. System Application of Hot Box Detectors.

midway point, an inspection stop is maintained, where the detectors are placed about five miles before the stop. Such a set-up would allow full advantage to be taken of them by eliminating journal burn-offs, reducing car set-out time, minimizing damage to journals and bearings, and utilizing man-power more efficiently.

DISCUSSION OF ECONOMIC CONSIDERATION

Savings which can be realized by use of infrared hot box detectors have often been mentioned and this is an area which warrants some consideration. Until detectors are used more extensively, it is difficult to calculate figures of complete validity. However, some research has been done along this line and some figures are available.

Hot boxes are a major cause of all accidents due to journal defects or failures and since 1953 have been increasingly larger contributors to accidents involving equipment failure. Practically 90% of all accidents caused by a hot box culminate in a derailment, and hot boxes are the largest single cause for derailments, accounting for roughly 14% in 1956 (4). These derailments cost the industry almost 6 million dollars in 1956, and over 8 million in 1957. This figure has been rising steadily in the past ten years with no promise of abatement.

Significantly, the above costs are a dramatic but small part of the overall picture. The day-to-day costs of repair and maintenance to freight cars is a staggering figure, amounting in 1956 to $572,110,661.00. Of this amount, a substantial part is the result of hot boxes. One roller bearing company's report (5) estimates an annual cost of $139.59 per car to maintain and repair journal and bearing assemblies. Statistics confirming this figure, approximately, have come from other reliable sources, including technical committees of various railroad organizations (6). This results in a total cost figure of nearly $250,000,000 per year incurred solely by hot box repairs.

This indicates that, if hot boxes and journal-bearing repairs can be substantially reduced by the improved inspection provided by the detectors, really large savings can be expected through their use.

CONCLUSIONS

The installation of infrared hot box detectors on any division provides immediate coverage of that division. There is no dilution of effective use in the sense that the entire railroad system must be covered. Savings are immediate in that vicinity and they stay on the road, so that from the moment of installation, full coverage is provided at that point.

The detector should not be considered a cure-all for the hot box problem. Repair and maintenance work will still have to be done, but the ability of detectors to provide early detection of trouble is a key point. Like most problems and diseases detected and diagnosed early, the remedy is comparatively simple and inexpensive. Savings can be expected primarily by the early detection of hot boxes, and the resulting decrease in major repair costs.

The other point is that early detection will radically decrease the number of derailments due to hot boxes. Not only does this save railroads the cost of loss and damage to railroad property, shippers' claims, and loss of revenue while the right of way is inoperative, but it provides a potent psychological factor in railroad public relations by offering increased safety to passengers and cargo.

These advantages indicate that infrared hot box detectors have a promising future in the railroad operations of tomorrow, and as long as the industry continues to look for ways to reduce costs, the detectors will contribute substantially towards that end.

ACKNOWLEDGMENT

The authors wish to express thanks to the management of Servo Corporation of America for making available the pictures and slides used in this article.

APPENDIX

1. An account of Herschel's experiment is given in Reference 1 of the bibliography.
2. Energy of any particular wavelength $\lambda = hc/\lambda$ where h is Planck's constant and c the velocity of light. The cutoff wavelength for photodetectors, therefore, is $hc/\lambda = E_o$ where E_o is dependent upon the "work function" of the detector material. For wavelengths such that hc/λ E_o the response of the detector is sharply reduced.
3. Heated targets do not radiate monchromatically but rather over a wide range of wavelengths over which band a peak response to some wavelength is evident. This peak and response curve will shift to the shorter wavelengths with increasing energy and temperature of the body.
4. One of these is the aforementioned "emissivity factor."

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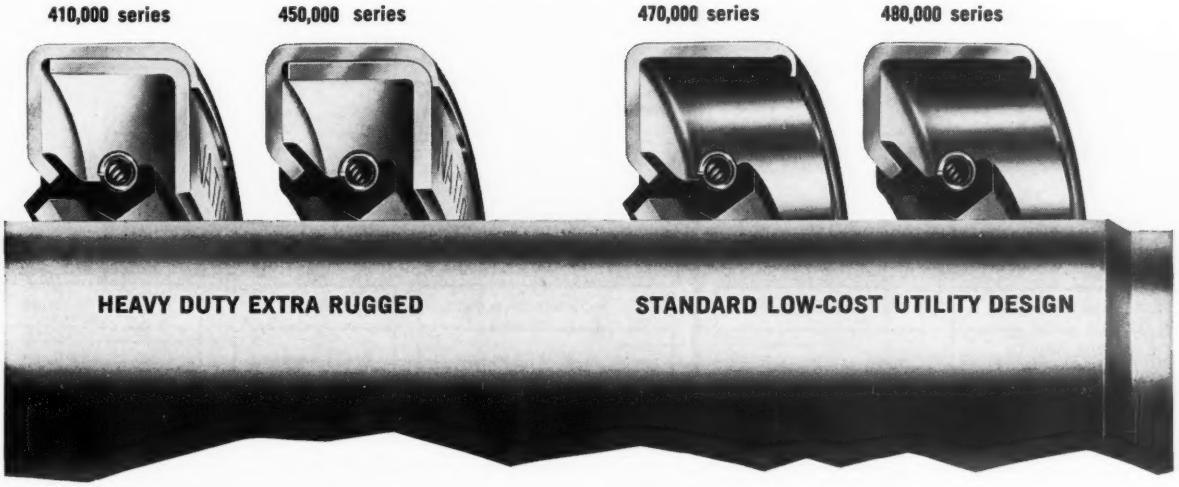

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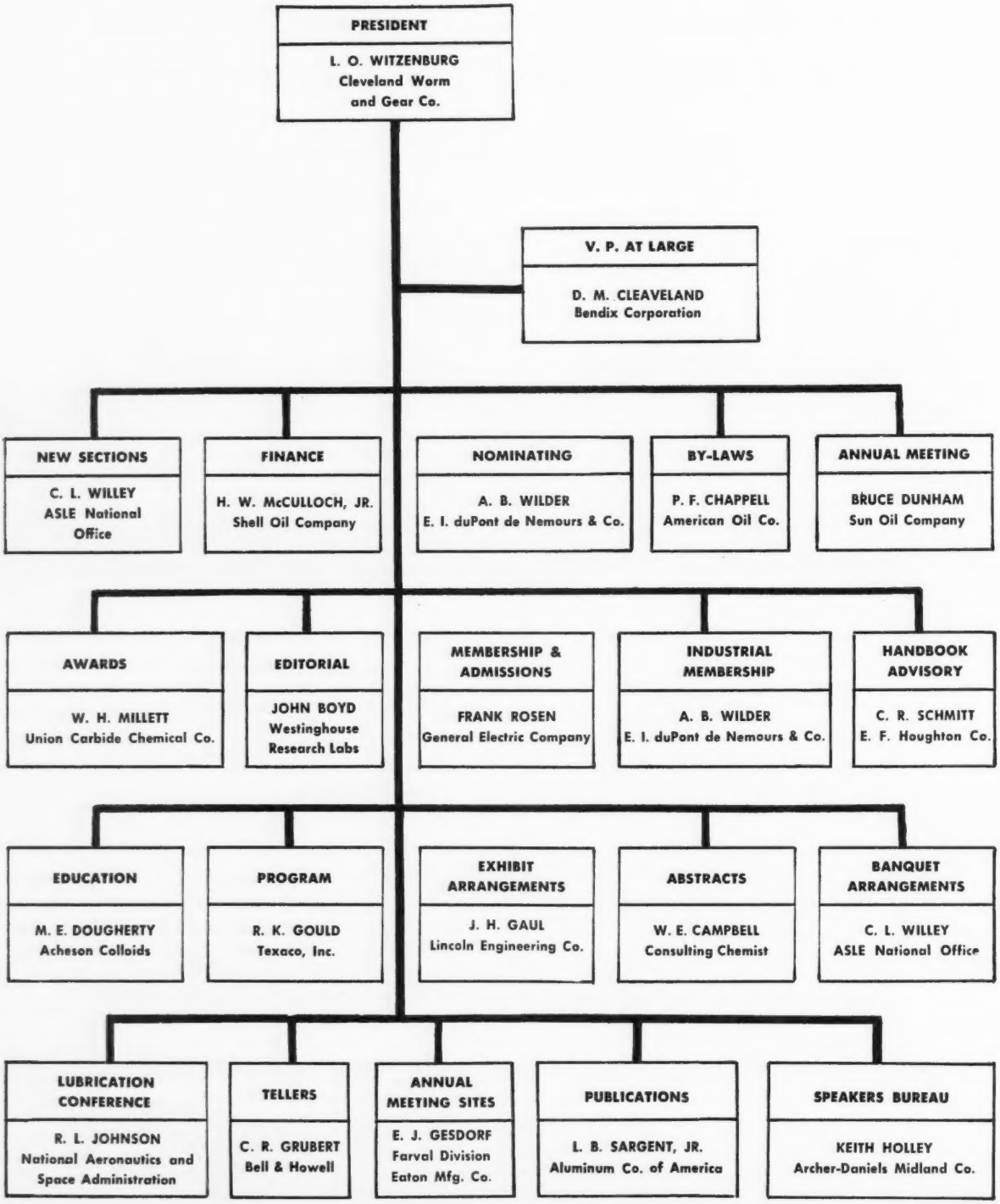

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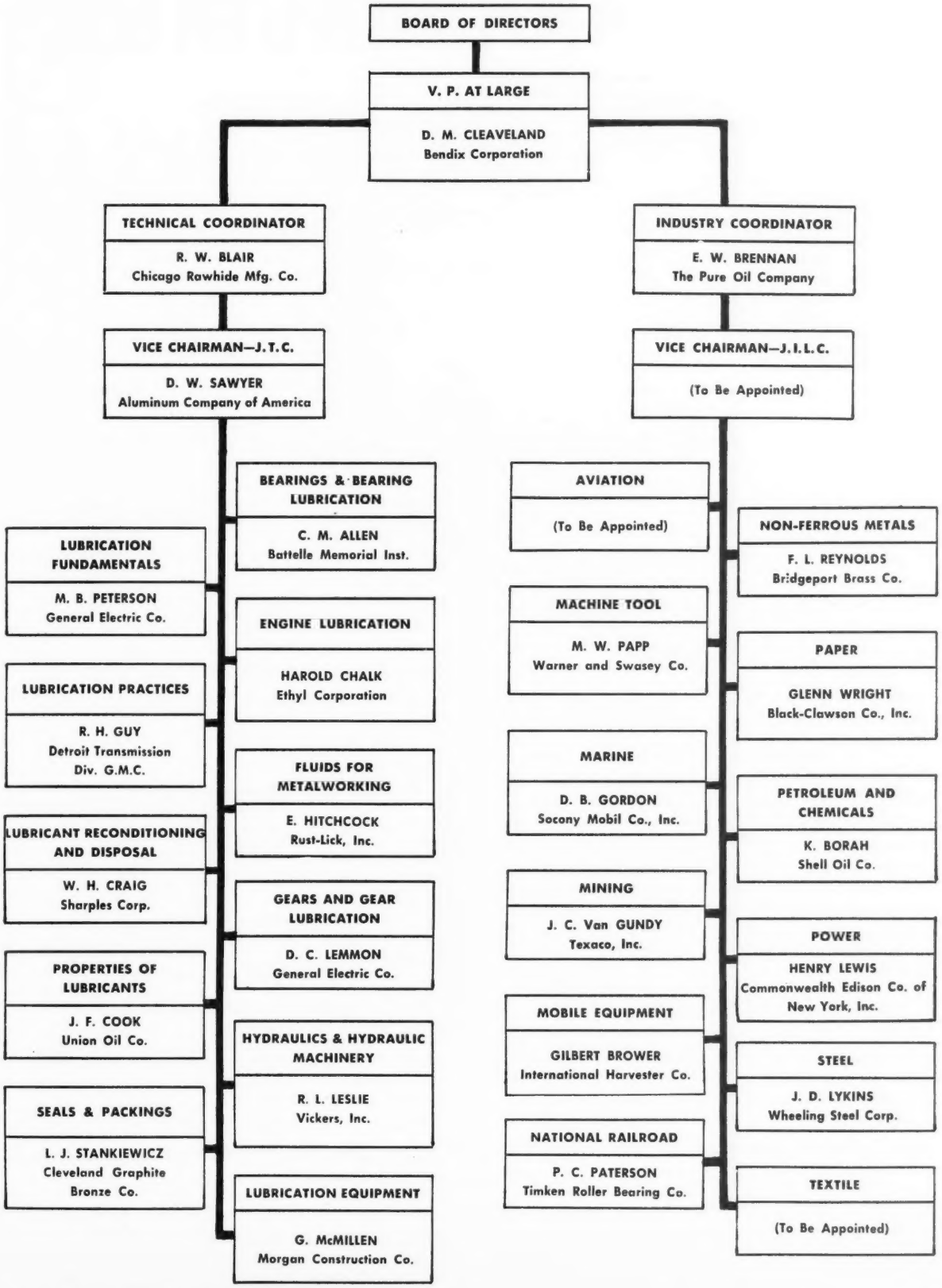

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ASLE Technical Digest

Papers which, because of space limitations, cannot be published in full in Lubrication Engineering or ASLE Transactions.

"Disposal and Conservation of Lubricating Oil by Re-Refining," by Alfred B. Two, Motor Oil Refining Co.

Certain types of petroleum lubricating oils are possessed of lubricating value even after prolonged periods of usage which has led to considerable contamination by non-lubricating foreign materials. Water, sludge (as a result of oxidation), entrained dust and dirt are the most usual contaminants which may gain entry or develop in service. With some types of internal combustion engine oils and industrial lubricating oils it may be economically practicable to adopt a procedure of re-refining for removal of these contaminants in order to approach more or less the lubricating value of the original oil. The process involves steam or vacuum distillation. The author outlines the basic steps in the re-refining process. He relates the advantages of using this process against the problem of waste oil disposal in some areas. The nature of the charging stock of used oil is important: indiscriminate inclusion of oils not strictly in the lubricating category is not advisable; the petroleum fractions should be compatible with the process. Accordingly the collection of used oil for re-refining should be a planned procedure.

Re-refining as a means for conservation of petroleum resources also is mentioned as an advantage which would be obvious in a period of decrease in reserves. Unfortunately no data are included whereby one could compare the properties of a re-refined lubricating oil with the corresponding properties of the original oil, although the statement is made that the process of re-refining tends to increase the viscosity index due to the removal of unstable aromatic hydrocarbons which could otherwise impart lower VI characteristics. The finished oil, however, must be refortified with additives suited to the intended use (where an additive oil is required) because all miscible as well as solid materials are removed during processing. (*Digested by A. F. Brewer*)

"Practical Discussion of Lubricating Oils and Greases," N. R. Hostler, Tidewater Oil Company

The author portrays the association of the petroleum industry with the manufacture of lubricants through an interesting assembly of charts. In discussing the latter, attention is drawn to the classification of the basic stocks from which the lubricating components are derived, the refining and treating procedures, and conventional refinery viscosity ranges. These data along with reference to terminology currently used in refinery procedures such as blending, compounding, straight mineral, and crude source areas, are of interest in the basic study of lubrication engineering and the applicability of the products involved.

The part played by additives with respect to stabilization of physical characteristics is referred to with some emphasis upon chemical stability. This is important in the manufacture of petroleum base greases which are normally referred to according to their soap base, i.e. calcium, sodium, mixtures of these elements, lithium, aluminum, etc. Here again the author refers to manufacturing terminology as involving type of structure, i.e. long or short fibre, gel structure, etc., stressing the importance of research in perfecting the considerable variety of lubricating products required to protect present-day machinery. (*Digested by A. F. Brewer*)

Lubrication Abstracts

Edited by W. E. Campbell

Selected literature compiled by members of the Technical Committees and Industry Councils of the Society.

Dr. J. George Wistreich, "ABC of Better Lubrication and Cooling in Steel Wire Drawing," *Wire & Wire Products*, v. 34, no. 11, 1959, 1486

Thick film lubrication and the removal of heat in high-speed wire drawing is discussed. Lubrication during dry lubricant wire drawing is "quasi hydrodynamic" and is aptly described by reference to a model. This investigation includes the substitution of thick film lubrication for boundary lubrication. This is done by utilizing the Christopherson principle in a three stage die and substituting wax or soap for liquid lubricants. Various types of soaps and modes of mechanical agitation are discussed, as well as specific mill results. Most important is the melt viscosity of the soap as a function of pressure, temperature and shear rate in the die. Temperatures are determined in the die throat and found to be a function of the cube root of velocity. Die cooling is not proven successful. Block cooling is investigated and the following conclusions drawn: (a) Superiority of water over air as a coolant out-weighs the disadvantage of having to prevent rusting and hard deposits on the block cooling surfaces, (b) Rust prevention is best achieved by a closed circuit fed with town's water and by pre-treating the cooling surfaces against rust, (c) The block should be thin walled; internal fins do more harm than good, (d) the best method is to improve cooling efficiency, rather than expending more coolant wastefully. (*Abstractor: E. W. Emmerich*)

Horace Frommelt, "Our Chip Making Efficiency is a National Disgrace," *Steel*, v. 145, no. 21, 1959, 78-79.

The production of machining chips in the U. S. accounts for $5 billion annually yet our machining efficiency is not more than 25 percent. A substantial boost in machining rates can be achieved by shorter tool life. Tools probably should not be run longer than 30 minutes on jobs now calling for tool changes not more than every 8 hours. The faster the operation, the shorter the tool life. Increased efficiency is possible by speeding up the equipment-keeping the cutting edge working at the highest possible metal removal rate. A speed-feed tabulation is provided showing how this chipmaking operation should be conducted. When a realistic tool life is followed, the result will provide an astonishing reduction in machine costs even though the tool material costs are multiplied two or three times, according to this author. (*Abstractor: R. McKay*)

J. Grindrod, "Lubrication of New Metals During Heat Treatment and Forming," *Scientific Lubrication*, v. 11, no. 1, 1959, 13-14.

The problems of lubrication and protection of new alloys developed from various metals for airplane construction are discussed. High-temperature lubrication by low-melting glasses in a molten condition is studied, and a coating is developed. (*Abstractor: R. McKay*)

"Automatic Die Lubrication Improves Forging Quality," *Steel*, v. 145, no. 10, 1959, 101.

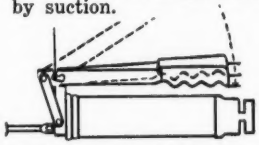
The increase in frequency of routine service operations makes equipment last longer. The application of an automatic die lubricator reduces reject and rework rates. The colloidal graphite and water lubricant is sprayed over the top die while the hot forging press is open. Previously, the press was lubricated by hand every ten strikes. Now, the top die is lubricated after every strike. (*Abstractor: R. McKay*)

John A. Boyd (Vice-President, VanStraaten Chemical Co., Chicago, Illinois), "Chosing the Lubricant for Carbides," *Tooling & Production*, v. 25, no. 6, 1959, 62.

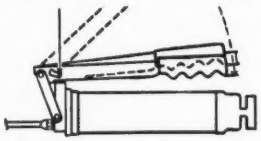
Cutting speed, tool design, metal being machined and operation performed may make an oil coolant more efficient than a water-soluble with carbide tools. Lubrication and cooling are both important and must be balanced according to the job requirements. At high speeds, cooling is more vital, hence, water solubles. High—strength, heat-resistant alloys require the weld-resistance of oil coolant. Form tools, with rubbing contact call for oil. On recessed cuts the adhesiveness of oils takes the coolant in to the tool's cutting edge. Solubles are being improved to give more lubrication and oils are made with better wetting and heat-exchange properties so the requirements of the job should govern the choice of coolant. (*Abstractor: N. C. Morrell*)

Lincoln introduces first high-low pressure grease gun

Here's the ALL-PURPOSE grease gun that lets you switch from high to low pressure with a flip of the latch pin. It also features the first 360° swivel nozzle to make hard-to-reach fittings easier to contact. Load it with a standard 14½ oz. grease cartridge, with a filler pump, or by suction.



Latch forward for high-pressure (10,000 psi max.) Delivers 1 oz. per 33 9" strokes of ¼" to 9".



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Patent Abstracts

Compiled by Ann Burchick
Aluminum Co. of America

Blended Grease Compositions, Patent #2,918,431 (A. J. Morway, assignor to Esso Research & Engineering Co.) A blended grease composition comprising a mixture of two component greases, one component being from 25 to 75% by weight of a sodium soap-salt complex thickened grease wherein the sodium soap-salt complex comprises a sodium soap of high molecular weight carboxylic acids having from about 12 to 30 carbon atoms per molecule and a sodium salt of low molecular weight carboxylic acids having about 1 to 3 carbon atoms per molecule, said complex being prepared at complexing temperatures of 430 to 510 F. and wherein the mol ratio of the salt to the soap in the complex is in the range of 0.5:1 to 1.25:1, and the other component being from 75-25% by weight of an alkaline earth metal mixed salt thickened grease wherein said alkaline earth metal mixed salt comprises low molecular weight carboxylic acids having from about 1 to 3 carbon atoms per molecule and intermediate molecular weight carboxylic acids having from about 7 to 10 carbon atoms per molecule wherein the mol ratio of the low to intermediate molecular weight carboxylic acids in the mixed salt is in the range of 2:1 to 25:1.

Pneumatic Tool Lubricant, Patent #2,918,429 (M. E. Gililland and R. C. Givens, assignors to Texaco Inc.) A pneumatic tool lubricant consisting essentially of a mineral lubricating oil having an SUS viscosity at 100 F. from about 100 to about 900, containing about 0.05 to 0.15 weight percent sulfur dispersed in said mineral oil, 0.5 to 2.0 weight percent alkali metal sulfonate, 0.2 to 3.0 weight percent of a phosphorus acid ester selected from the group consisting of oil-soluble and oil-miscible di and trialkyl, aryl and mixed alkyl-aryl phosphates and phosphites, and 0.05 to 0.2 weight percent of a mercaptobenzothiazole corrosion inhibitor.

Silica-Thickened Grease Containing Carbamate Ester Stabilizer, Patent #2,921,900 (N. L. Remes, T. W. Martinek and E. T. Fronczak, assignors to The Pure Oil Co.) A lubricating grease consisting essentially of a major portion of a lubricating oil having incorporated therein a small amount of finely divided silica sufficient to produce a gel-like grease structure and a carbamate ester.

Ricinoleyl Lubricants, Patent #2,922,764 (T. L. Boswell and C. M. Davis, assignors to Elgin National Watch Co.) A lubricant consisting of ricinoleyl alcohol and an ether, said ether constituting at least 5 percent by weight of the mixture of alcohol and ether.

Anti-Rust Lubricating Oil, Patent #2,921,027 (E. W. Brennan, assignor to The Pure Oil Co.) A lubricating oil composition consisting essentially of a major portion of a mineral lubricating oil, a small amount of a polyvalent metal salt of an alkyl phenol sulfide selected from the group consisting of the barium salt of diisobutyl phenol sulfide, the cobalt salt of diisobutyl phenol sulfide, the barium salt of tertiary amyl phenol sulfide, and the cobalt salt of tertiary amyl phenol sulfide, a small amount of calcium petroleum sulfonate, a small amount of a polyvalent metal salt of an alkyl dithiophosphate selected from the group consisting of zinc hexyl dithiophosphate, zinc heptyl dithiophosphate, zinc octyl dithiophosphate, cadmium heptyl dithiophosphate, and cadmium octyl dithiophosphate, and at least about 0.2 weight percent of a polyoxy-ethylene sorbitan monofatty acid ester containing from 3 to 6 moles of ethylene oxide per molecule wherein the fatty acid esterifying group is selected from the group consisting of oleate, laurate, palmitate and stearate groups.

Lubricating Compositions, Patent #2,916,449 (E. R. Vierk and T. J. Karr, assignors to Sinclair Refining Co.) A lubricant composition consisting essentially of about 75 to 99 weight percent of a mineral lubricating oil, about 0.3 to 5 weight percent of a sulfonate selected from the group consisting of calcium mahogany petroleum sulfonates and barium mahogany petroleum sulfonates, about 0.5 to 1.8 weight percent of zinc dialkyl dithiophosphate containing about 3 to 18 carbon atoms in the organic radicals and about 0.3 to 3.5 weight percent of alkyl phenyl phosphate in which each alkyl chain present contains about 3 to 18 carbon atoms, said composition having a viscosity index of at least about 85 and a viscosity (SUS) at 100 F. of about 650 to 1000.

Method of Inhibiting Squawking in Mineral Oil Transmission Fluids, Patent #2,913,415 (H. E. Schmitz, assignor to Shell Development Co.) A process of inhibiting squawking, chattering and squealing in power transmissions operated on mineral lubricating oil by addition thereto of from about 0.001% to about 1% by weight of an oil-soluble mono-alkane phosphinic acid, said alkane radical having from 4 to 20 carbon atoms and from about 0.001% to about 1% of a fatty acid selected from the group consisting of lauric acid, palmitic acid, and stearic acid.

Silica-Thickened Grease Containing Carbamate Ester Stabilizer, Patent #2,921,900 (N. L. Remes, T. W. Martinek and E. T. Fronczak, assignors to The Pure Oil Co.) A lubricating grease consisting essentially of a major portion of a lubricating oil having incorporated therein a small amount of finely divided silica sufficient to produce a gel-like grease structure and a carbamate ester.

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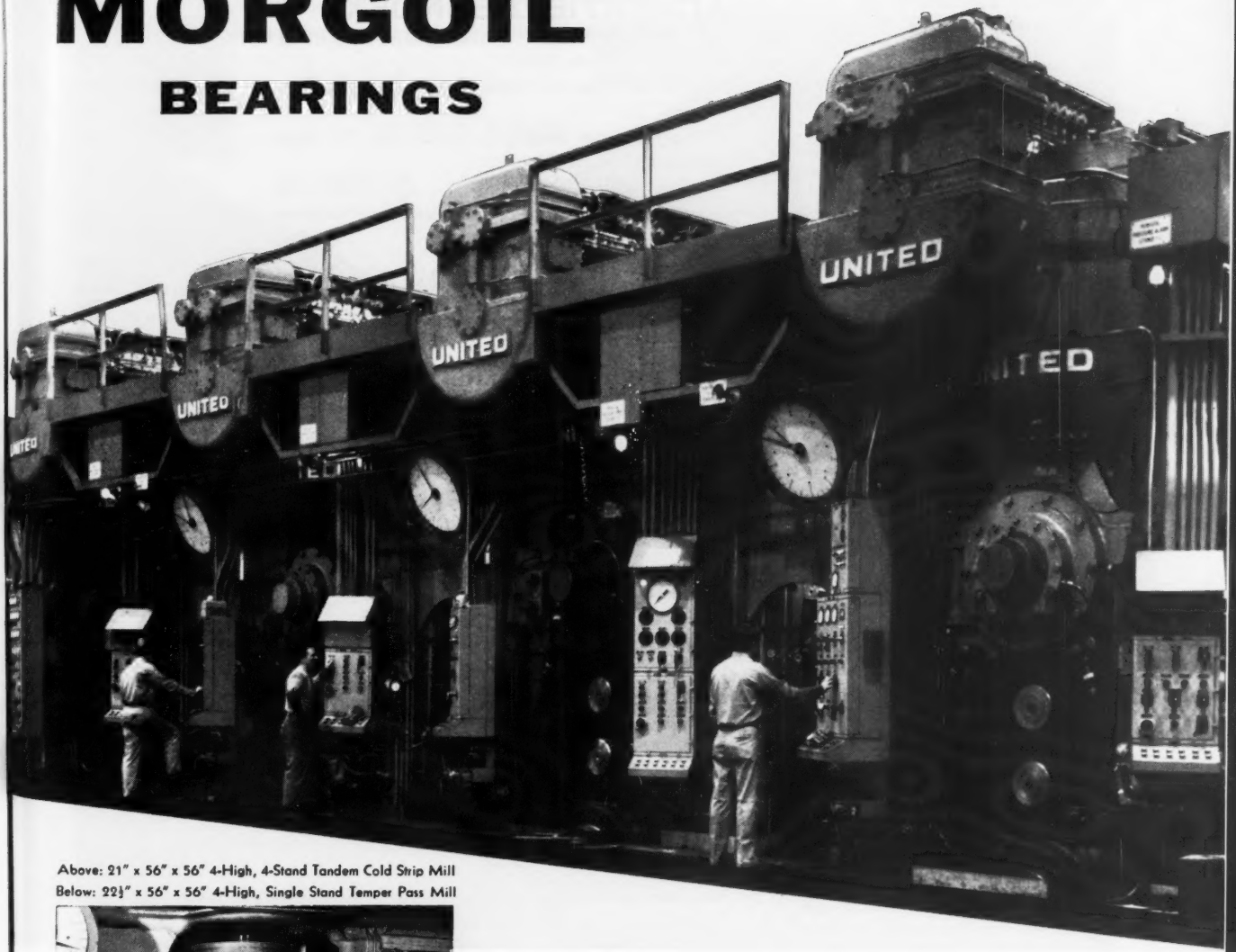

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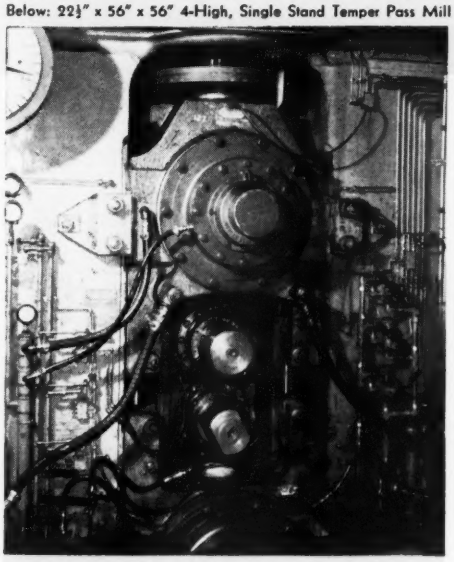
Below: 22½" x 56" x 56" 4-High, Single Stand Temper Pass Mill



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LUBE IN THE NEWS

(Continued from page 336)

GRADUATE DEGREES, HIGH CLASS STANDING STRESSED BY COMPANIES

As usual, demand for and salaries offered June engineering graduates have substantially exceeded pre-hiring season estimates, say latest placement office reports. While the job market for non-technical graduates is "adequate but unspectacular," engineering and scientific graduates are reaping the benefits of a "sensational" demand, according to Business Week's annual survey of university placement officers and company personnel men throughout the country.

At the University of Michigan, where salary offers had previously been expected to increase by about 1.8 per cent over 1959, the engineering placement office now reports a jump of five percent over last year. Bachelor degree holders are getting offers averaging $535, as compared to $508 of last year, and for masters degrees, salaries are up from $601 to $621.

In spite of the tremendous demand, the Business Week survey reports that companies are still choosy. Increasing emphasis is being put on graduate degrees, and many research and development firms will not even consider students not in the top third or quarter of their classes. (Source: National Society of Professional Engineers)

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PRODUCTION ENGINEERING SHOW IN CHICAGO RUNS CONCURRENTLY WITH MACHINE TOOL SHOW

Automation, the key to manufacturing during the 1960's, will be the theme of most exhibits at the Production Engineering Show. The huge exposition will cover both sections of Chicago's Navy Pier and will run concurrently with the Machine Tool Show at the International Amphitheatre, September 6 through 16.

Many of the controls and other auxiliary equipment exhibited at the Production Engineering Show will be used by exhibitors at the Machine Tool Show to keep the machine tools running there. Thus, the expected 125,000 visitors will be able to inspect the equipment at Navy Pier and see how it works when attached to huge machine tools at the International Amphitheatre. (Source: Banner and Greif, New York)

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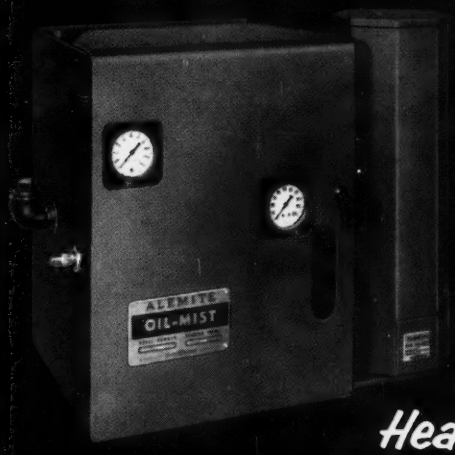

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